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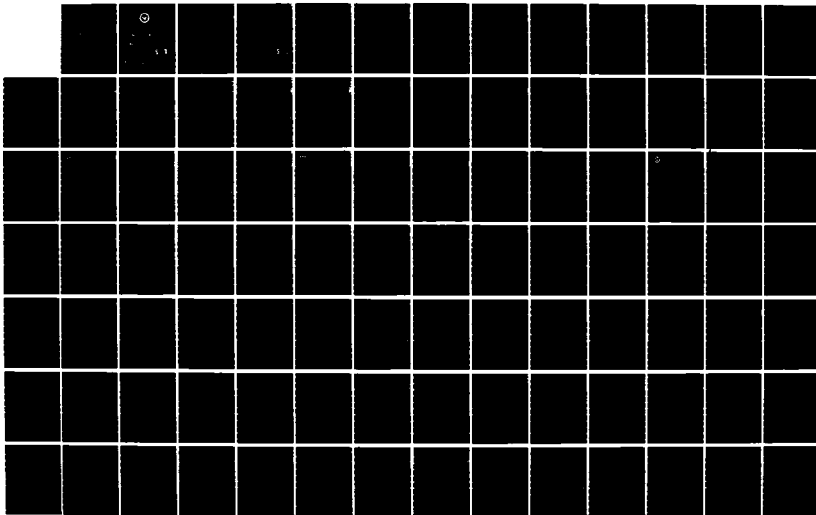
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ENVIRONMENTAL LEADERSHIP PROJECT WASHINGTON DC
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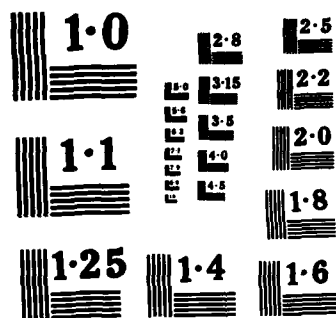
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RECOVERY, REUSE AND RECYCLE OF SOLVENTS

DECEMBER 1985

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Defense Environmental Leadership Project

1717 H Street N.W., Room 202

Washington, D.C. 20006 - 3901

(202) 653-1273, AV 294-1273

Richard W. Boubel, Ph.D., P.E.

December 1985

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DISCLAIMER

Mention of specific items of equipment, trade names, consultants, suppliers or industries does not constitute an endorsement by the U.S. Department of Defense. Names and addresses are provided only as a convenience for readers of this report. No evaluations have been made concerning the environmental compliance of any of the specifically named firms.

PURPOSE AND OBJECTIVES

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INTRODUCTION

Sol-vent (sol'vent, solv)n 1. Chem. a. The component of a solution that is present in excess or that undergoes no change of state. b. A liquid capable of dissolving another substance, "The American Heritage Dictionary," Second College Edition.

The broad term, "Solvents," covers a wide spectrum of chemicals used for many purposes. 80 percent of all manufacturing companies use solvents. The quantity of solvents used by the Department of Defense (DoD) is exceeded only by the quantity of fuel, when organic chemicals are inventoried. The generation of waste solvents, with their subsequent disposal, is one of the most significant hazardous waste problems of the services today.

In past years, waste solvents were disposed of in the manner most convenient to the user of the solvent. Little thought was given to economics or environmental effects. Solvents were considered as expendable supplies. Today, because of the regulations concerning disposal of hazardous wastes plus the economics of solvent disposal and replacement, solvent recovery, reuse, and recycle (R³) is mandated as DoD policy.

- o R³ is practiced to assure compliance with regulations. These regulations may be DoD or other governmental units such as the U.S. Environmental Protection Agency (EPA) or state or local agencies.
- o R³ eliminates concern for future liability, groundwater contamination, etc.
- o R³ is most successfully practiced by the facility which generates the waste. If no other facility or agency is involved, the total responsibility remains with the generating facility.
- o R³ eliminates the need for the permits and other paper work necessary to dispose of large volumes of hazardous waste. The solvent stays in a logical cycle instead of being continually supplied, used, and disposed of.
- o R³ results in cost savings that are real and impressive. Even for solvents costing a dollar or two per gallon, the total disposal cost may be as high as \$10 per gallon. Previously, the true disposal costs were hidden from the user because they are paid by the Defense Reutilization and Marketing Office (DRMO), not the facility.
- o Some DRMO's were selling used solvents for a few cents on the dollar of their original cost. If it was economical for off-facility recyclers to deal in used solvents, it stands to reason that R³ by the facility itself will be economical.

DEPARTMENT OF DEFENSE USED SOLVENT ELIMINATION PROGRAM

Recognizing a need to improve DoD solvent disposal practices, a Used Solvent Elimination (USE) program was initiated by Assistant Secretary of Defense, Dr. Lawrence J. Korb, on 10 January 1984. The USE program has the goal of eliminating by October 1, 1986, disposal of recyclable solvents as wastes. Appendix A is a summary of the USE program.

The specific guidance for the USE program states the intent of DoD:

The preferred disposition of used solvents is recycling either on or off the generating installation, using solvent reclamation equipment. Even relatively small systems can pay back the initial capital investment in a few years. Disposal of most non-chlorinated solvents (e.g., mineral spirits) by burning as a fuel replacement to extract the heating value is an acceptable form of recycle. Burning solvents for disposal purposes only is not acceptable.

An alternative means of solvent disposal is sale through a Defense Reutilization and Marketing Office. This should be used only if there are overriding reasons which rule out recycle. To ensure that recycling is used where feasible, decisions to dispose of solvents through a DRMO must be reviewed by higher headquarters. The review must be accomplished by knowledgeable personnel, with appropriate technical assistance if required. The higher headquarters must be a flag officer command.

Disposal of organic solvents as waste is not acceptable except for that small fraction of the total solvent waste stream which cannot be recycled (i.e., the still bottoms and sludges) or for small volumes (less than 400 gallons per year, total, of all solvents generated at one installation). Disposal of small volumes of waste must be by sale to a resource recovery facility or by transfer to an approved hazardous waste disposal facility.

DEPARTMENT OF DEFENSE INCENTIVE PROGRAM FOR HAZARDOUS WASTE REDUCTION/RECYCLING

The Defense Environmental Leadership Project (DELP), is promoting and supporting the Productivity Enhancing Capital Investment (PECI) program which is administered by the Defense Productivity Program Office (DPPO). The Peci program provides up-front money to fund capital investments, such as solvent stills and collection systems, and provides incentives to allow the use of the benefits, in excess of the cost, to be used as discretionary funds by the installation commander. Appendix B explains this incentive program and also contains the DoD Instruction on the Peci program. Because of the favorable pay-back potential of many solvent R³ systems, the Peci program not only enables rapid purchase of the system but can return much more money to the base commander than the present practice of sales through the DRMO.

SOLVENT USE BY DOD

The key to successful solvent R³ is complete segregation throughout the entire solvent use cycle. Do not mix solvents, do not contaminate solvents with water or foreign material, and make sure that solvent containers are properly labeled (Solvent name, new or used, contact point for responsibility, contaminant etc.) Appendix C is a partial listing of solvents used by DoD.

Solvent usage by DoD facilities is extensive as to the quantity used but can be grouped into a short list as to the systems using the solvent:

Metal Cleaning - This includes processes such as degreasing before finishing, oil and grease removal for cleanup, protective surface removal, and cleaning of wheel bearings. Both hydrocarbon solvents and halogenated solvents are used for metal cleaning. Examples are PD-680, 1,1,1 Trichloroethane, and Tetrachloroethylene (Perc).

Electronics Cleaning - Freon 113 or Freon TF plus 11% acetone are used extensively for electronic and precision part cleaning.

Painting and Finishing - Many paints and other protective coatings are composed of pigments and solids in an organic base (carrier). When the paint "dries" the organic base evaporates leaving the desired coating. To "thin" these finishes, a solvent similar to, or the same as, the original organic base is used. Both hydrocarbon solvents and oxygenated solvents may be used for paints. Thining is viscosity reduction to permit the finish to be applied properly. The other use of solvent for painting and finishing is for cleanup of the brush, applicator, or spray gun used for applying the coating to the part. Without solvent R³, all of the solvents used for painting and finishing enter the atmosphere as an air pollutant, or are disposed of as waste.

Flushing Systems - Solvents are used to flush the fuel tanks of aircraft before repairs or rebuild. If the flushing solvent is of a different vapor pressure from the vapor pressure range of the fuel, it can be recovered by distillation and recycled. Water and sludge are contaminants that can be separated during the process. The aircraft fuel can be reclaimed and is used as fuel for ground-based operations.

Printing - Printing is similar to painting except that the solvents used evaporate quicker. Solvents are also used for cleanup of the equipment.

Calibration Fluids - Some organic calibrating materials used by DoD are catalogued as "Solvents". An example is normal heptane which is used to calibrate jet engine fuel system components because it is a pure chemical while JP-4 is a mixture and may vary in viscosity, vapor pressure, etc. It may not be possible to clean the used heptane sufficiently to reuse it as a calibration fluid but it could still be blended and downgraded for use as a metal cleaner, such as using it to clean wheel bearings. Heptane is also an excellent cleaner for plexiglass.

SUCCESSFUL R³ SYSTEMS

R³ depends upon three factors, Economics, and Technology, and Motivation. If the technology exists, but the economics do not show significant cost/benefit ratios, then R³ must be forced through regulations. If the economics are favorable, but the technology is not developed, then research and development is necessary to advance the technology. If both the economics and the technology are favorable, R³ will proceed rapidly. If neither favorable economics or viable technology exist then R³ is not an acceptable alternative. In any case, the third factor is necessary, the motivation of the people that use and recycle solvents.

The Industrial Extension Service, School of Engineering, North Carolina State University, Raleigh, North Carolina has published an excellent booklet, "Managing and Recycling Solvents - North Carolina Practices, Facilities, and Regulations," December, 1984. In this booklet, they make the following recommendations:

To simplify waste solvent handling and to make recycling feasible, the following procedures should be followed:

- (1) Keep solvents segregated! In the reclamation process it is much easier to separate a solvent from its impurities than to separate two solvents.
- (2) Keep waste solvents as free from water and garbage as possible. Label the container as SOLVENT FOR RECYCLE, keep the container closed and, if possible sheltered from rain.
- (3) Where feasible, use solvents in a "countercurrent" manner to minimize the need for new high purity material.
- (4) Keep a chemical identification label on each waste container. Record the exact composition and the method by which the waste solvent was generated.
- (5) Don't label "in-process" solvents as wastes. These materials come under RCRA when called a waste!
- (6) Avoid the Part B Permitting process by not storing "waste" solvents over ninety days.
- (7) Move carefully in selecting outside recyclers or waste handlers by checking reputation, insurance, financial stability, and backlog of untreated materials. Work out a clear, contractual relationship.
- (8) Check your recycler to verify that he promptly recycles your solvent and to find out how he disposes of any residues.
- (9) If solvents are to be burned for fuel or incinerated, keep the BTU value high and the chlorine and metal contents low.
- (10) Train your personnel to assist you in your hazardous waste program, especially 1 through 5 above.

Several different systems exist for R^3 of solvents. Most are off-the-shelf units and many are listed in the GSA catalog. Appendix D lists various recycling equipment manufactures. It is incumbent on the person choosing the system to look at all alternatives, considering both economics and technology. Solvent R^3 systems include:

Small stills - Certainly the largest number, and possibly the largest total throughout of R^3 systems in DoD is by the use of small stills. These are most frequently batch, non-fractionating distillation units of 15 to 55 gallons capacity.

Batch distillation systems typically consist of a still pot, a heat source, and condenser. The waste organic mixture is loaded into the still pot, heat is applied to the contents, causing the mixture to boil, and organic vapors separate from the waste mixture and pass overhead to the condenser. Cleaned organic fluid is then collected for reuse, and still bottoms are disposed of as hazardous waste.

An atmospheric still can reclaim organic solvents that have boiling ranges less than 400°F. By adding vacuum, a distillation unit can be used to recover

organic fluids which have atmospheric boiling points up to 500°F, while a 300°F limit is maintained in the still's pot.

Small stills, listed in the GSA Scheudle and used at DoD facilities have been manufactured by:

Finish Engineering Co., Inc.
921 Greengarden Road
Erie, PA 1650
Phone (814) 1445-4478

and

Recyclene - Zerpa Industries, Inc.
1910 Trade Zone Blvd.
San Jose, CA 95131
Phone (408) 945-8600

Large stills - Stills capable of handling 50 to 250 gallons of solvent per hour have been used in central locations at DoD facilities. These are usually vacuum distillation units with the energy supplied by either a fossil fuel fired, or electric, steam boiler.

Large stills are usually engineered for a specific solvent, throughput, and energy source rather than being purchased as an off-the-shelf item. One such unit, of 200 gallon per hour capacity, consisted of a Western-Hilmor 200 Industrial Still with a Reimers Electra Steam, Model RHP 200 boiler. The supplier was Gardner Machinery Corporation of Charlotte, North Carolina. Finish Engineering, mentioned in the previous section, has also supplied large stills to DoD installations.

Complete R³ Systems - The main advantage of operating a large centralized system is that capital costs can be recovered quickly due to economies of scale. A centralized facility can redistill large quantities of various types of solvents. Since many different types of solvents are recycled, great care must be taken with waste segregation and sample analysis. Centralized reclamation also requires that solvents be transported to and from the point of use.

Robins AFB has been able to successfully recycle solvents in a large-scale operation because of careful waste segregation, storage, and transportation. Site managers are responsible for segregation and labeling of waste drums at 30 different collections areas. Before solvents are reclaimed, samples are analyzed to confirm the labeling. Samples are also analyzed after distillation to ensure that they meet appropriate specifications.

Solvent recycling has been successful at Robins AFB because of a strong commitment from management to reduce the quantities of waste solvents that must be disposed of. Of equal importance, production personnel have cooperated with the recycling team so that waste solvents can be segregated, labeled, analyzed, transported, and redistilled in an orderly and systematic fashion.

Successful centralized facilities depend on a fully dedicated individual to initiate and supervise operation of the system and an enthusiastic staff dedicated solely to solvent collection, analysis, recycling, and distribution. Decentralized facilities require the assignment of personnel (foreman and operators) to adopt solvent recovery as part as their routine.

Robins AFB, located in Macon, Georgia, has operated a centralized batch, atmospheric still since August of 1982. The solvent recovery system consists of a single-stage batch still, a water separator, and an electrically powered steam generator. The still, which can operate up to a temperature of 300°F, in the pot, can reclaim solvents at a rate of 55 gallons per hour. It is used to reclaim trichloroethane, Freon-113, and isopropanol at recovery rates of 70 to 99 percent.

Solvent Rental Service - The usual cycle of solvents through DoD is purchase-use-disposal. An alternative to this cycle is for an outside party to own the solvent and rent it to the DoD facility. In practice, the system is "elegant in its simplicity." The company rents the machine which consists of a pump and sink unit which sits on top of a drum of solvent. As parts are cleaned under the stream of solvent, the dirty solvent drains from the sink, through a filter, and back into the drum. When the solvent becomes contaminated with the residue, the company brings a drum of clean solvent and takes away the dirty solvent. The old solvent is sent to a recycling center where it is treated by settling and distillation to yield about 66% recycled solvent. The DoD facility does not need EPA, RCRA part B permits for the waste solvent. These are issued to the supplier, who owns the solvent. However, state regulations may require the facility to register all solvent using processes in order to operate. The principal supplier of this service is the Safety Kleen Corporation of Elgin, Illinois.

Burning for Energy - Incineration of solvent is prohibited by the USE program but burning for energy production is listed as an acceptable use for used solvent. If the used solvent is burned directly as received, it is probably co-fired with another fuel such as natural gas or fuel oil. Often the used solvent will be blended with heavy fuel oil, or used crankcase oil, to reduce the viscosity of the heavier oil. The oil-solvent mix is then fired directly into the boiler fire box.

Carbon Adsorption - Activated carbon will trap and retain organic gases that would normally escape to the atmosphere. This use generally is required where breathing air is recirculated, such as air conditioning systems, or where volatile organic compounds (VOC) need to be collected from exhaust gases to comply with air pollution regulations. When the carbon becomes loaded with organic material it can be regenerated and the organic material recovered. At high organic concentrations, such as a building exhaust from paint spraying booths, the solvent can be recovered economically and reused.

Process Modification - If the industrial process can be modified to reduce or eliminate the use of solvent, it should be investigated as a possible alternative even though it is not strictly R³. Examples of such modifications are conversion from wet solvent paint removal systems to dry media paint stripping (plastic blasting), changing from solvent based paint to water based paint, and, specifying dry powder painting instead of wet, solvent based spray painting.

SOLVENT COST WORKSHEETS

A very detailed outline and discussion of the economics of R³ is found in, "GUIDE FOR DEVELOPING A RECYCLABLE MATERIALS SALES PROGRAM," Hazardous Materials Department, Naval Energy and Environmental Support Activity, Port Hueneme, California 93043, September 1984. This material has been modified to be specific for solvent R³ and is presented as a valuable guide.

DETERMINING ECONOMIC FEASIBILITY

Recycling solvent saves money, but it may not always be economical. Costs of running the program may exceed savings. Therefore, do not undertake a recycling program without an economic analysis. An economic analysis will help decide the feasibility of establishing a recycling program. Analyses should be made for all possible alternatives, stills, renting, substitution, etc.

Reference. For more information on approved methods for performing economic analyses, see NAVFAC Publication P-442, Economic Analysis Handbook. Figure 1 provides a worksheet for documenting an economic analysis for distillation. A sample economic analysis is shown as figure 2.

Assumptions. Added costs are the increased time, effort, and possibly equipment associated with removing a recyclable material from the waste stream and subsequently preparing it for sale.

Avoided costs are decreases in the off-site costs of waste handling, hauling, and disposal by removing a recyclable material from the waste stream.

The sale of recyclable material is economically feasible if

$$\text{added costs} < \text{avoided costs} + \text{revenue}$$

Determining Added Costs. The added costs of a recycling program consist of the initial costs of establishing the program and the annual costs of operating the program.

Initial Costs. Estimate the cost to build new facilities, procure necessary equipment, and prepare and implement operational and administrative procedures. Examples are costs of construction or renovating buildings or sheds, costs of purchasing trucks, stills, drums, pumps, etc.; costs of preparing instructions, financial records, and procedures; and training costs.

Depending on the types of facilities/equipment needed, use appropriate amortization schedules to spread cost over several years.

Annual Costs. For each recyclable solvent, estimate the annual maintenance and labor costs. If facilities/equipment used for waste disposal are also used for recyclable materials, prorate maintenance costs to each recyclable solvent. Labor costs include estimates for collection, handling, storage, packaging, segregation, administration, overhead, etc.

Determining Avoided Costs. Estimate avoided costs by determining the volume of each recyclable solvent diverted from the waste disposal stream. Calculate tipping fees, surcharges, labor, prorated maintenance, hauling fees, permit fees, and generator "taxes" that are saved by recycling that quantity of solvent, instead of disposing of it.

Determining Revenue. For each recyclable solvent, estimate annual sales revenue. Use DRMO market survey data for these estimates.

Is a Recycling Program Economically Feasible?

The qualifying recycling program is economically feasible if

$$\text{added costs} < \text{avoided costs} + \text{revenue}$$

For the example calculated in Figure 2, the recycling project will cost the base \$3,460 per year because the added costs exceed the avoided costs plus revenue. However, if the value of the recovered solvent increases to \$1.65 per gallon the recycling project would show a return to the base of \$540 per year.

NOTE: For calculations, approximate solvent costs, as shown in Appendix E, may be used if actual values are not known.

FIGURE 1

WORKSHEET FOR
DETERMINING WASTE SOLVENT ECONOMIC ANALYSIS

Activity/Complex: _____ Preparer: _____
Location: _____ Date: _____

Target recyclable material: _____ Gals/yr: _____

**ESTIMATED
ADDED COSTS**

1. Source separation and material preparation

a. Equipment (amortize over 10 yrs.) \$ _____/yr.
b. Labor
(1) Procurement (amortize over 10 yrs.) \$ _____/yr.
(2) Operations \$ _____/yr.
(3) Maintenance \$ _____/yr.
c. Other (materials, supplies) \$ _____/yr.
Subtotal: (\$ _____/yr.)

2. Collection and storage

Equipment and facilities
(amortize over 20 yrs.) \$ _____/yr.
b. Labor
(1) Procurement (amortize over 20 yrs.) \$ _____/yr.
(2) Operations \$ _____/yr.
(3) Maintenance \$ _____/yr.
c. Other (materials, supplies) \$ _____/yr.
Subtotal: (\$ _____/yr.)

3. Program administration

a. Instructions and operating procedures \$ _____/yr.
b. Fiscal management \$ _____/yr.
c. Publicity \$ _____/yr.
Subtotal: (\$ _____/yr.)

TOTAL ADDED COSTS \$ _____/yr.

ESTIMATED AVOIDED COSTS AND REVENUE

1. Savings resulting from reduced volume of
solvent going to disposal facilities \$ _____/yr.
2. Sales revenue or recycle value \$ _____/yr.
TOTAL AVOIDED COSTS + REVENUE: \$ _____/yr.

FIGURE 2

WORKSHEET FOR
DETERMINING WASTE SOLVENT ECONOMIC ANALYSIS

Activity/Complex: High Flight AFB Preparer: John Doe
Location: Upper, NY Date: 21 May 1985

Target recyclable material: Stoddard Solvent PD-680 Gals/yr: 16,000

ESTIMATED
ADDED COSTS

1. Source separation and material preparation		
a. Equipment (amortize over 10 yrs.) (still plus site)	\$ 5,000/yr.	
b. Labor (\$15 per hr + \$5 per hr overhead)		
(1) Procurement (amortize over 10 yrs.) (1,000 hr)	\$ 2,000/yr.	
(2) Operations (400 hr/yr)	\$ 8,000/yr.	
(3) Maintenance (30 hr/yr)	\$ 600/yr.	
c. Other (materials, supplies) (10,000kw @ \$0.05)	\$ 500/yr.	
	Subtotal:	(\$ 16,100/yr.)
2. Collection and storage		
a. Equipment and facilities (truck 1 day/wk) (amortize over 20 yrs.) (warehouse - 300 sq. ft.)	\$ 800/yr.	
b. Labor		
(1) Procurement (amortize over 20 yrs.) (100 hr)	\$ 100/yr.	
(2) Operations (400 hr/yr)	\$ 8,000/yr.	
(3) Maintenance (30 hr/yr)	\$ 600/yr.	
c. Other (materials, supplies) (drums etc)	\$ 200/yr.	
	Subtotal:	(\$ 9,700/yr.)
3. Program administration		
a. Instructions and operating procedures (100 hr/yr)	\$ 2,000/yr.	
b. Fiscal management (25 hr/yr)	\$ 500/yr.	
c. Publicity (5 hr/yr)	\$ 100/yr.	
	Subtotal:	(\$ 2,600/yr.)
	TOTAL ADDED COSTS	\$ 28,400/yr.

ESTIMATED AVOIDED COSTS AND REVENUE

1. Savings resulting from reduced volume of solvent going to disposal facilities (15¢/gal)	\$ 2,400/yr.
2. Recycle Savings = 16,100 gal/yr x \$1.40 gal	\$22,540/yr.
TOTAL AVOIDED COSTS + REVENUE:	\$24,940/yr.

This example indicates that the added cost exceeds the avoided costs and revenue by \$3,460 per year.

SUCCESSFUL DOD SOLVENT R³

The examples cited in this section have been collected by several methods. These includes solicitation of the services for success stories, submissions from consultants, and personal visits by DELP staff. These examples are certainly not all that exist. Many successful R³ efforts have not been brought to the attention of those responsible for this publication. If you have information concerning a successful R³ effort for solvents please complete a copy of the form shown as Figure 3 and send it to:

USE Program Manager
Defense Environmental Leadership Project
1717 H. Street N.W., Room 202
Washington, DC 20006-3901

A generalized reporting form has been used for collection, and presentation, of solvent R³ information. This form is shown as Figure 3 on the following page. This is the format which will be utilized in the computerized data base on solvents which DoD is developing.

Note that the National Stock Number and Specification Number is a obtained from Appendix C.

Figure 3. Successful R³ Application

- I. Facility Information
 - A. Name -
 - B. Location -
- II. Solvent Information
 - A. Name -
 - B. National Stock Number (NSN), See Appendix C -
 - C. Specification (Spec) Number, See Appendix C -
- III. Process Parameters
 - A. Process Name & Description
 - B. Quantity of Solvent Used -
 - C. Contamination Material -
- IV. Point of Contact for Information
 - A. Name -
 - B. Title -
 - C. Address -
 - D. Phone -
- V. All Costs
 - A. Solvent -
 - B. Handling -
 - C. Disposal -
 - D. R³
 - 1. Fixed -
 - 2. Variable -
- VI. Benefits
 - A. \$ Savings (May be negative) -
 - B. Manpower Savings (May be negative) -
 - C. Environmental -
- VII. Recycling Equipment and Performance
 - A. Name and Description -
 - B. Purchased from -
 - C. Throughout Rate -
 - D. Recovery (percent) -
 - E. Recovered Solvent Purity -
- VIII. Remarks (use additional sheet if necessary) -

**Solvent R³ Application
Case No. 1**

- I. Facility Information**
 - A. Name - Norfolk Naval Shipyard
 - B. Location - Portsmouth, VA
- II. Solvent Information**
 - A. Name - Thinner, Epoxy
 - B. National Stock Number (NSN), See Appendix C - 8010-01-168-0684
 - C. Specification (Spec) Number, See Appendix C - MIL-T-81772
- III. Process Parameters**
 - A. Process Name & Description - Batch, Vacuum, Nonfractionating still
 - B. Quantity of Solvent Used - 150 gallon per month
 - C. Contamination Material - paint pigments
- IV. Point of Contact for Information**
 - A. Name - A.R. (Jake) Coulter
 - B. Title - Supervisor, Painting
 - C. Address - X 71, Bldg 1499, Norfolk Naval Shipyard
Portsmouth, VA 23709
 - D. Phone - (804) 396-7723
- V. All Costs**
 - A. Solvent - \$4.00 per gallon, \$480 per month
 - B. Handling - (Est.) \$75/month
 - C. Disposal - (Est.) \$936/month
 - D. R³
 - 1. Fixed - (still cost \$8,545) for 10 years, \$71/month
 - 2. Variable - 15¢/gallon + \$63.42/month for labor = \$85.92
- VI. Benefits**
 - A. \$ Savings (May be negative) - \$1,334/month, 6½ month payback
 - B. Manpower Savings (May be negative) - about equal
 - C. Environmental - No solvent disposal, no future liability
- VII. Recycling Equipment and Performance**
 - A. Name and Description - Finish Engineering Co. Little Still LS-15V
 - B. Purchased from - Extratech Corporation, P.O. Box 533, Olney, MD 20832
(301) 924-5150
 - C. Throughout Rate - 15 gallon per 8 hours
 - D. Recovery (percent) - 80
 - E. Recovered Solvent Purity - Used for clean up of spraying equipment.
Probably not equal to new specs for thinning paint
- VIII. Remarks** - Jake Coulter is installing additional stills at other stations where cleanup occurs.

Solvent R³ Application
Case No. 2

- I. Facility Information
 - A. Name - Warner Robins Air Logistics Center
 - B. Location - Robins Air Force Base, GA
- II. Solvent Information
 - A. Name - FC-77 Heat Transfer Fluid
 - B. National Stock Number (NSN), See Appendix C - 6850-00-905-9098
 - C. Specification (Spec) Number, See Appendix C - MIL-H-81829
- III. Process Parameters
 - A. Process Name & Description - Mix with acetone and water, decant organic phase, through dessicant column to remove water.
 - B. Quantity of Solvent Used - Approximately 1800 gallons/year
 - C. Contamination Material - Dirt and water
- IV. Point of Contact for Information
 - A. Name - O.H. Carstarphen
 - B. Title - Engineer
 - C. Address - MADF, Robins Air Force Base, GA 31098
 - D. Phone - (AV) 468-5477
- V. All Costs
 - A. Solvent - \$220/gallon, \$395,000/year
 - B. Handling - \$2/gallon \$3,600/year
 - C. Disposal - \$10/gallon, \$18,000/year
 - D. R³
 - 1. Fixed - (estimated) \$5,000 unit = \$500/year
 - 2. Variable - \$2.00 Per Gallon = 3,600/year
- VI. Benefits
 - A. \$ Savings (May be negative) - \$390,000/year
 - B. Manpower Savings (May be negative) - (1.0 to operate)
 - C. Environmental - No disposal, no future liability
- VII. Recycling Equipment and Performance
 - A. Name and Description - Separator (own construction)
 - B. Purchased from - Own construction
 - C. Throughout Rate - 18 gallon/hr
 - D. Recovery (percent) - 100%
 - E. Recovered Solvent Purity - Meets specs for use
- VIII. Remarks - (use additional sheet if necessary) - High value product which makes system extremely cost effective.

Solvent R³ Application
Case No. 3

- I. Facility Information
 - A. Name - Warner Robins Air Logistics Center
 - B. Location - Robins Air Force Base, GA
- II. Solvent Information
 - A. Name - Fluid, purging, preserving, fuel system
 - B. National Stock Number (NSN), See Appendix C - 6850-00-965-2356
6850-01-011-8082
 - C. Specification (Spec) Number, See Appendix C - MIL-F-38299
- III. Process Parameters
 - A. Process Name & Description - Solar Still
 - B. Quantity of Solvent Used - 30,000 gallon/year
 - C. Contamination Material - JP-4, water, sludge
- IV. Point of Contact for Information
 - A. Name - O.H. Carstarphen
 - B. Title - Engineer
 - C. Address - MADF, Robins Air Force Base, GA 31098
 - D. Phone - (AV) 468-5477
- V. All Costs
 - A. Solvent - \$2.40/gallon
 - B. Handling - (estimate) \$1.00/gallon
 - C. Disposal - (estimate) \$2.00/gallon
 - D. R³
 - 1. Fixed - (cost of solar still \$40,500) \$4,050/yr
 - 2. Variable - \$4586 per year
- VI. Benefits
 - A. \$ Savings (May be negative) - \$153,000/year
 - B. Manpower Savings (May be negative) - (1.0 to operate)
 - C. Environmental - No disposal, no future liability
- VII. Recycling Equipment and Performance
 - A. Name and Description - Purge Fluid Reclamation System (Solar)
 - B. Purchased from - Own design and construction
 - C. Throughout Rate - 180 to 300 gallon/min
 - D. Recovery (percent) - 100
 - E. Recovered Solvent Purity - meets specs for re-use
- VIII. Remarks (use additional sheet if necessary) -

Solvent R³ Application
Case No. 4

I. Facility Information

- A. Name - Warner Robins Air Logistics Center
- B. Location - Robins Air Force Base, GA

II. Solvent Information

- A. Name - (1) Trichloroethane, (2) *FREON -113, (3) Isopropanol (Isoproyl Alcohol)
*Note: FREON is trade name for 1,1,2 Trichloro-1,2,2-Trifluroethane
- B. National Stock Number (NSN), See Appendix C - (1) 6810-00-476-5612, 6810-00-476-5613, 6810-00-551-1487, 6810-00-664-0275, 6810-00-664-0388, (3) 6810-00-543-7915, 6810-00-855-1158, 6810-00-855-6160, 6810-00-926-8993
- C. Specification (Spec) Numbers, See Appendix C - (1) MIL-T-81533, O-T-620, (3) TT-I-735

III. Process Parameters

- A. Process Name & Description - Atmospheric pressure batch still
- B. Quantity of Solvent Used - 18,190 gallon/year (total)
- C. Contamination Material - (1) wax, oil and grease, dirt (2) sealant and oil (3) oil and dirt.

IV. Point of Contact for Information

- A. Name - O.H. Carstarphen
- B. Title - Engineer
- C. Address - MADF, Robins Air Force Base, GA 31098
- D. Phone - (AV) 468-5477

V. All Costs

- A. Solvent - (1) \$3.48/Gallon (2) \$13.00/gallon (3) \$3.50/gallon
- B. Handling - (estimate) \$1.00/gallon
- C. Disposal - (Estimate) \$2.00/gallon
- D. R³
 - 1. Fixed - (still cost \$48,000) for 10 years, \$4,800/year
 - 2. Variable - \$0.24/gallon

VI. Benefits

- A. \$ Savings (May be negative) - \$137,000/year
- B. Manpower Savings (May be negative) - (2.0 to operate)
- C. Environmental - No disposal, no future liability

VII. Recycling Equipment and Performance

- A. Name and Description - Atmospheric pressure Batch Still, Finish Engineering Corp.
- B. Purchased from - Extratech Corporation, P.O. Box 533, Olney MD 20832 (301) 774-5325
- C. Throughout Rate - 55 gallon/hour
- D. Recovery (percent) - (1) 70, (2) 95, (3) 95
- E. Recovered Solvent Purity - (1) meets MIL-SPEC (2) will not meet MIL-SPEC, used for initial cleaning, (3) 99.8%

VIII. Remarks - Note: Different solvents (1) trichloroethane, (2) FREON - 113, (3) isopropanol are recycled in the same still on a batch basis.

Solvent R³ Application
Case No. 5

- I. Facility Information
 - A. Name - Warner Robins Air Logistics Center
 - B. Location - Robins Air Force Base, GA
- II. Solvent Information
 - A. Name - (1) Dry cleaning solvent (2) Silicone Damping Fluid (3) Paint thinners (4) Coolanol 25 R Fluid
 - B. National Stock Number (NSN), See Appendix C - (1) 6850-00-264-9037, 6850-00-274-5421, 6850-00-285-8011, 6850-00-285-8012, 6850-00-637-6135, 6850-00-823-7934 (2) N.A. (3) Various (4) N.A.
 - C. Specification (Spec) Number, See Appendix C - (1) PD-680 (2) N.A. (3) Various (4) N.A.
- III. Process Parameters
 - A. Process Name & Description - Vacuum still, 300°F limit will recover organics with atmospheric boiling points up to 500°F
 - B. Quantity of Solvent Used - Various
 - C. Contamination Material - Various
- IV. Point of Contact for Information
 - A. Name - O.H. Carstarphen
 - B. Title - Engineer
 - C. Address - MADF, Robins Air Force Base, GA 31098
 - D. Phone - (AV) 468-5477
- V. All Costs
 - A. Solvent - Vary
 - B. Handling - (Estimate) \$1.00/gallon
 - C. Disposal - (Estimate) \$2.00/gallon
 - D. R³
 - 1. Fixed - (Still cost \$97,000) for 10 years, \$9,700/year
 - 2. Variable - \$0.50/gallon
- VI. Benefits
 - A. \$ Savings (May be negative) - \$315,000/year, estimate
 - B. Manpower Savings (May be negative) - (+2.0 to operate)
 - C. Environmental - No disposal, no future liability
- VII. Recycling Equipment and Performance
 - A. Name and Description - Vacuum still, Finish Engineering Corp.
 - B. Purchased from - Extratech Corporation, P.O. Box 533, Olney, MD 20832 (301) 924-5150
 - C. Throughout Rate - ?
 - D. Recovery (percent) - ?
 - E. Recovered Solvent Purity - ?
- VIII. Remarks (use additional sheet if necessary) - Purchased December, 1984

Solvent R³ Application
Case No. 5

- I. Facility Information
 - A. Name - Puget Sound Naval Shipyard
 - B. Location - Bremerton, Washington
- II. Solvent Information
 - A. Name - FREON 113
 - B. National Stock Number (NSN), See Appendix C - 6830-00-584-2957
 - C. Specification (Spec) Number, See Appendix C - BB-F1421
- III. Process Parameters
 - A. Process Name & Description - Distillation
 - B. Quantity of Solvent Used - 25,000 gallons per year
 - C. Contamination Material - Oil, Water, Grease, Dirt
- IV. Point of Contact for Information
 - A. Name - John Davis
 - B. Title - Environmental Engineering
 - C. Address - Environmental Engineering, C/440.7, PSNS, Bremerton, WA 98314
 - D. Phone - Autovon 439-4049 or Commercial (206) 476-4049
- V. All Costs
 - A. Solvent - \$11.33 per gallon
 - B. Handling - \$25 per year
 - C. Disposal - \$25 per year
 - D. R³
 - 1. Fixed - negligible
 - 2. Variable - \$12.70 per day See Remarks
- VI. Benefits
 - A. \$ Savings (May be negative) - \$282,310 per year
 - B. Manpower Savings (May be negative) - 0
 - C. Environmental - \$10,700 per year
- VII. Recycling Equipment and Performance
 - A. Name and Description - Model #MRS-60 Freon Solvent Recovery Still
 - B. Purchased from - Baron-Blakeslee
 - C. Throughout Rate - 60 gallons per hour
 - D. Recovery (percent) - 99%
 - E. Recovered Solvent Purity - 1 ppm impurities in product
- VIII. Remarks - Unit normally operates 70 days in a year for an average annual operating cost of \$890

SOLVENT RENTAL APPLICATIONS

Solvent rental may be the most cost effective method for complying with both USE and RCRA. This is particularly true of facilities that use more solvent than the de minimus amount of 400 gallons per year but not enough to justify on-base recycling. The Safety-Kleen Corp. has over 5,000 of its units placed with over 700 DoD customers.

Safety-Kleen is not the only company which offers a solvent rental, exchange program. Appendix F is a listing of firms which offer varying degrees of various solvent supply and recycling services.

Some of the DoD facilities, using the Safety-Kleen System are reported in Appendix G.

CIVILIAN SOLVENT R³ APPLICATIONS

The civilian sector is faced with the same problems concerning solvent usage as DoD. These include high purchase cost, high disposal cost, future liability, etc. To solve these problems, R³ procedures have been introduced by many industries. Recyclene, Zerpa Industries Inc., 1910 Trade Zone Blvd., San Jose, CA 95131 and Finish Engineering Co., 921 Greengard on Road, Erie, PA 16501-1591 have supplied the information used for Appendix H.

An excellent booklet, "Managing and Recycling Solvents, North Carolina Practices, Facilities, and Regulations, December 1984", has been prepared by Jerome Kohl, Phillip Moses, and Brooke Triplett for the Industrial Extension Service, School of Engineering, North Carolina State University, Raleigh, North Carolina. Some of these case studies, which can be related to DoD operations, are also included in Appendix H.

APPENDIX A
USED SOLVENT ELIMINATION (USE) PROGRAM

<u>DATE</u>	<u>ITEM OR ACTION</u>
FEB 1983	Report, "Evaluation of Disposal Concepts for Used Solvents at DoD Bases," prepared for Defense Property Disposal Service by the <u>Aerospace Corporation</u> . The objective of this study was to evaluate alternative disposal concepts for used solvents at DoD installations. It proposed a number of recommended recycle and reuse improvements which were more cost effective than incineration or other destructive disposal practices. Economic benefits of \$10.3 million were projected for DoD-wide annual savings. Action plans necessary to implement used solvent elimination were suggested.
JUN 1983	Above report (<u>Aerospace</u>) was circulated to the services and <u>DLA</u> , for review, and comments on the feasibility of implementing the recommendations it contained.
JUN 1983	The DoD Inspector General, Office of the Assistant Inspector General for Auditing, sent a Draft Report on the " <u>Audit of Used Solvents</u> " (Project 258-096) to the Deputy Assistant Secretary of Defense (Installations), OASD(MRA&L). The objectives of this audit were to determine if appropriate environmental safeguards were observed in storing and disposing of used solvents and whether solvents were reused when practical.
JUL & AUG 1983	Services replied to the <u>Aerospace</u> study. It was generally agreed that it was an informative report but may have been overly optimistic regarding economic benefits. It also was weak in areas of qualitative testing, training of operators, and actual total costs.
JUL 1983	The <u>Audit</u> report was circulated to the services and <u>DLA</u> , by OSD, for review and comments. Comments were to include a substantive description of the corrective actions planned.
AUG 1983	Services replied to OASD(MRA&L) regarding the <u>Audit</u> report and the results were summarized by Robert A. Stone and sent as a Memo to the Director, Logistics and Support Programs, Office of the Assistant Inspector General for Auditing. The memo listed several points:

- We generally concur with the conclusions and recommendations in the subject report.
- We disagree with the predicted \$40 million annual savings and feel that the \$10.3 million savings predicted by the Aerospace report is more realistic.
- Your estimate does not consider capital investments to initiate segregation and reclamation processes, operating costs, or service charges by commercial recyclers.

JAN 1984

A memo was sent by Dr. Korb to the Secretaries of the Military Departments and the Director of DLA establishing the Used Solvent Elimination (USE) Program. This memo is included. USE started here.

FEB 1984

The Assistant Inspector General for auditing issued a Memo to the Deputy Assistant Secretary of Defense (Installations), OASD(MI&L) covering the final Audit Report on Used Solvents (Report No. 84-031). The last two sentences of this memo are:

The Deputy Assistant Secretary of Defense (Installations) needs to provide the estimated dates for issuance of the instructions to implement Recommendations B.1, B.2 and B.3. The dates should be provided to us within 60 days of this report.

The recommendations B.1, B.2, and B.3 were:

B.1. Periodically analyze discharges from industrial waste treatment plants if there is a potential for solvents to enter the system and, if solvents are detected, either prevent the solvents from entering the treatment plant or equip the plant to destroy the solvents.

B.2. Stop discharging hazardous substances into storm drains and adequately pretreat substances before discharge into domestic sewage systems.

B.3. Follow the Environmental Protection Agency's guidance on use of ponds for holding hazardous waste.

Included as a Recommendation for Corrective Action was the following:

We recommend that the Deputy Assistant Secretary of Defense (Installations) issue Defense Environmental Quality Program Policy Memorandums that:

1. Require DoD activities to recycle or reclaim solvents if economically feasible; to sell, through Defense Property Disposal Offices, all recyclable used solvents that cannot be recycled or reclaimed by the activity or a nearby activity; and finally, to dispose of only nonrecyclable solvents.
2. Require each activity to identify and mark hazardous waste containers with the contents as the waste is generated; prevent water from getting into the waste or eliminate water from hazardous waste prior to disposal; and review methods of disposal and, where possible, adopt more economical methods.

The report also agreed that the Aerospace figure of \$10.3 million annual savings should be used instead of the draft Audit figure of \$40 million.

MAR 1984

A Memo was sent from Robert A. Stone to the Assistant Secretaries of the Army, Navy, Air Force and the Director of DLA requesting implementation of the DIG's recommendations from the Audit report. A copy of that memo follows:

AUG 1984

A Memo was sent from Robert A. Stone to the Assistant Secretaries of the Army, Navy, Air Force and The Director of DLA changing the minimum volume of used solvent considered for the USE program. A copy of the memo follows:

FEB 1985

A Memo was sent from Carl C. Schafer, Jr. to the Assistant Secretaries of the Army, Navy, Air Force and the Director of DLA prohibiting landfill disposal of waste solvent. A copy of the memo follows:



MANPOWER
RESERVE AFFAIRS
AND LOGISTICS

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

10 JAN 1984

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Used Solvent Elimination (USE) Program

The recent Defense Inspector General's report on solvent handling indicated we need to improve solvent disposal practices. Aerospace Corporation's technical evaluation of our waste solvent management procedures showed we can economically recycle nearly all of our waste solvents. These findings, and the increasing risk of multimillion dollar cleanup costs if solvents are improperly discarded, clearly indicate that we should do everything possible to totally eliminate disposal of solvents as waste.

Accordingly, I request that you initiate a Used Solvent Elimination (USE) program with the goal of eliminating by October 1, 1986, disposal of recyclable solvents as wastes. You will find specific guidance for the USE program in Attachment 1.

Please submit a copy of your implementing instructions and progress reports (see Attachment 2 for format) to the Director of Environmental Policy on December 15, 1984, December 15, 1985, and December 15, 1986. Each report should reflect the program's status at the close of the previous fiscal year.

If you have any questions, please contact Dr. Don Emig at X79789.

Lawrence J. Korb



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INSTALLATIONS
AND LOGISTICS

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, DC 20301

7 MAR 1984

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (IL&FM)
ASSISTANT SECRETARY OF THE NAVY (S&L)
ASSISTANT SECRETARY OF THE AIR FORCE (MRA&I)
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Used Solvent Program

By our memorandum dated January 10, 1984, military departments and DLA were requested to initiate a Used Solvent Elimination (USE) program. The USE program goal is the elimination of the disposal of recyclable solvents as wastes by October 2, 1986. The Defense Inspector General, in an audit report on used solvents, Report No. 84-031, February 2, 1984, has made certain other recommendations pertaining to used solvents. A copy of that report has been provided under separate cover.

The purpose of this memorandum is to request that you implement the following recommendations of the Defense Inspector General:

- Periodically analyze discharges from industrial waste treatment plants if there is a potential for solvents to enter the system. If solvents are detected, either prevent the solvents from entering the treatment plant or equip the plant to treat the solvents.
- Stop discharging hazardous substances into storm drains and adequately pretreat substances before discharging into domestic sewage systems.
- Follow the Environmental Protection Agency's guidance on the use of ponds for holding hazardous wastes.
- Identify and correct potential contamination problems in hazardous waste storage areas.

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Please submit a copy of your implementation instructions to my Director of Environmental Policy. Progress reports should be included with those requested in the January 10 memorandum (December 15, 1984, December 15, 1985, and December 15, 1986.

If you have any questions, please contact Dr. Don Emig, 653-1273.



Robert A. Stone
Deputy Assistant Secretary of Defense
(Installations)



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AND LOGISTICS

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, DC 20301

13 SEP 1984

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (IL&FM)
ASSISTANT SECRETARY OF THE NAVY (S&L)
ASSISTANT SECRETARY OF THE AIR FORCE (MRA&L)
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Used Solvent Elimination (USE) Program

By our memorandum dated January 10, 1984, the military departments and DLA were requested to initiate a Used Solvent Elimination (USE) program. The USE program goal is the elimination of the disposal of recyclable solvents as wastes by October 2, 1986. The Defense Inspector General, in an audit report on used solvents, Report No. 84-031, February 2, 1984, has made certain other recommendations pertaining to used solvents. A copy of that report has been provided previously under separate cover.

The purpose of this memorandum is to change the amount of solvent defined in the specific guidance for the USE program, which was attachment 1 to the January 10, 1984, memorandum. The Environmental Protection Agency has proposed amendments to RCRA which would establish the quantity of hazardous waste to be exempt from regulations as less than 100 kilograms per month. This waste must still be managed in an "adequate manner" and may be subject to stricter regulation by state or local authorities.

Since many used solvents are classed as hazardous waste, it is reasonable for DoD facilities to use the same limiting value when complying with both EPA and DoD regulations. 100 Kilograms per month is approximately 400 gallons per year of organic solvent. The exact volume depends on the specific gravity of the solvent.

Accordingly, the fifth paragraph of attachment 1 to the January 10, 1984, USE memo, is changed to read:

Disposal of organic solvents as waste is not acceptable except for that small fraction of the total solvent waste stream which cannot be recycled (i.e., the still bottoms and sludges) or for small volumes (less than 400 gallons per year, total, of all solvents generated at one installation). Disposal of small volumes of waste must be by sale to a resource recovery facility or by transfer to an approved hazardous waste disposal facility.

If you have any questions, please contact Dr. Richard Boubel, 653-1273.

Robert A. Stone
Deputy Assistant Secretary of Defense
(Installations)

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OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON, DC 20301

20 FEB 1985

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (I&L)
ASSISTANT SECRETARY OF THE NAVY (S&L)
ASSISTANT SECRETARY OF THE AIR FORCE (MRA&L)
DIRECTOR, DEFENSE LOGISTICS AGENCY

SUBJECT: Used Solvent Elimination (USE) Program, Interim
Guidance

The purpose of this memorandum is to provide interim guidance for the disposal of waste solvents pending full implementation of the USE program and development of applicable regulations by the Environmental Protection Agency in response to the Hazardous and Solid Waste Amendments 1984.

The Used Solvent Elimination (USE) Program goal is to eliminate the disposal of recyclable solvents as wastes by October 2, 1986 (see our memo of January 10, 1984). Specifically it is DoD policy that the disposal of organic solvents as waste is not acceptable. The exception is that small fraction of the total waste stream which cannot be recycled (i.e., the still bottoms or sludges) or for small volumes (less than 400 gallons, per year total). Disposition of the latter must be by sale to a resource recovery facility or to an approved hazardous waste disposal facility (see our memo of September 13, 1984 on the same subject). The Hazardous and Solid Waste Amendments of 1984 ban the land disposal of solvents (F001, F002, F003, F004 and F005 as cited in 40 CFR 261.3) as well as dioxins and other toxic wastes effective 24 months after enactment unless EPA determines that such a prohibition is not required to protect human health and the environment.

The Environmental Leadership Project has funded a study by the ICF Corporation to compare the true costs of landfill disposal and incineration of certain DoD hazardous wastes. The study concluded that in most cases, incineration is the least true cost disposal method for solvents. This conclusion is clearly general in that the least cost alternative for disposal of any particular DoD waste will depend on the specific location, facility type, and unique environmental setting. However, solvent wastes disposed by DoD could be justifiably incinerated at a lower total cost than if they were landfilled. Incineration is less expensive if future costs associated with landfilling corrective actions, clean-ups, groundwater monitoring, and claims are considered in the analysis.

I am therefore requesting all DoD components take immediate action to prohibit landfill disposal of waste solvents. Specifically those waste solvents identified as hazardous wastes F001, F002, F003, F004, and F005 in 40 CFR 261.3 are banned from future land disposal. This ban excludes household wastes and provides for exemptions consistent with provisions in the Resource Conservation and Recovery Act. This action does not require cancellation of existing disposal contracts, however, any future contract awards, extensions or renewals should include terminology to specifically prohibit land disposal of solvents.

If you have any questions please contact Mr. M. B. White, at 653-1273.



Carl J. Schafer, Jr.
Director, Environmental Policy

cc: OASA(I&L)
OASN(S&L)
SAF/MIQ
DLA-W

APPENDIX B
DOD INCENTIVE PROGRAM FOR HAZARDOUS WASTE REDUCTION/RECYCLING
AND
DOD INSTRUCTION FOR PRODUCTIVITY ENHANCING CAPITAL
INVESTMENT PROGRAM

Introduction

Carl Schafer, Director of Environmental Policy, OSD, recently gave an interview to a reporter from "Inside EPA". The January 4, 1985 issue of "Inside EPA" reports from this interview as follows:

"One of Schafer's personal goals is to devise a DoD policy that encourages waste recycling and reduction by setting up a system that rewards DoD installation commanders.

A base commander now has no incentive to save money through waste reduction, Schafer explained, because "he'll just get his budget cut" or the savings are "returned to the U.S. Treasury." Schafer would like to set up a system that would return savings through waste minimization to the base itself, for other improvements. This may take legislative reforms to DoD's appropriations process, Schafer noted, but he said that the high priority Congress places on environmental protection should ease any legislative changes necessary."

Private industry has many economic incentives to reduce pollution. These include depreciation of equipment and facilities, tax rebates, low interest bonds, and increased profits. DoD facilities have no such incentives. In fact, some economic disincentives exist (money for sales of used solvents is returned to the base commander but nothing is realized if the solvent is recycled and reused).

Several possible alternatives can be envisioned which would reward installation commanders for saving money through waste recycling and reduction. The Defense Environmental Leadership Project (DELP) has investigated many of these alternatives since its inception in early 1984. These investigations have been continually encouraged by OSD personnel and by the environmental staffs of the various services. It now appears that one very positive course of action can be recommended because it offers the greatest chance of success of the many alternatives.

Action

DELP will promote and support the Productivity Enhancing Capital Investment (PECI) program which is administered by the Defense Productivity Program Office (DPPO) which operates under ASD(M).

The Table on the following page is an overview of the PECI program.

Reasons for This Action

- The PECI program is an established, recognized, viable program. It would not be productive for DELP to duplicate this program or compete with it. The DoD Instruction, Number 5010.36, establishes the policy and procedures for PECI.
- The PECI program is accepted by the U.S. Congress, DoD, and other U.S. Government agencies (GAO, OMB, OPM, etc.).
- The PECI program is accepted and promoted by the individual services. In fact, they are an important link in the program. Applications come from the services and funds are allocated thru the services.
- The PECI program does what DELP wants. It provides up-front money to fund capital investments and provides incentives to allow the use of the benefits in excess of the cost to be used by installation commanders for, " - - valid unfunded requirements during the operating budget year." (see, E. POLICIES, 8., page 3 of DoD Instruction No. 5010.36). The base commander would have to list how the funds would be spent but any reasonable, legal use would be acceptable.
- The DPPO does the majority of the work required by OSD. This includes administration, accounting, recordkeeping and reporting.

Implementation of an Environmental Project

- DELP will assure that facilities and personnel are made aware of the PECI. DELP will aid in sending PECI forms and instructions to facility/personnel.
- PECI application forms are filled out by the facility and sent to their designated service POC who is responsible for PECI efforts.
- The service POC examines the proposal for feasibility and ranks it in the priority listing which they send to DPPO.
- DPPO receives all applications with the priority listing from each service.
- If a proposed project reduces or controls environmental pollution, DPPO sends a copy of the application to DELP for the environmental compliance verification and feasibility review.
- DELP reviews the proposal and returns it to DPPO with a recommendation for action.

THE DOD PRODUCTIVITY ENHANCING

CAPITAL INVESTMENT PROGRAM

- AN OVERVIEW -

INVESTMENT EFFORT	STARTED IN FY	COST LIMITS	PAYBACK PERIOD	INVESTMENT TARGET	\$ FROM
PRODUCTIVITY ENHANCING INCENTIVE FUNDS (PEIFs)	1977	<\$100,000	2 YEARS	SMALL DOLLAR LABOR/COST SAVING EQUIP. IN ALL DOD ACTIVITIES	SERVICE BUDGET FOR SPECIFIC PROJECTS
PRODUCTIVITY INVESTMENT FUNDS (PIFs)	1981	>\$100,000	4 YEARS	MAJOR EQUIPMENT/ FACILITIES SELECTED ON BASIS OF RATES OF RETURN-ALL DOD ACTIVITIES	TO SERVICE BUDGET WITH PROJECT IDENTIFIED AND INCLUDE IN ANNUAL OSD BUDGET REQUEST
COMPONENT- SPONSORED INVESTMENT FUNDS (CSIs)	1981	ESTABLISHED BY EACH SVC/ AGENCY	VARIABLE	MISSION ORIENTED INVEST. PROJECTS COMPLEMENT OSD FUNDS	

- DPPO establishes the final listing priority and notifies the service POC's who notify the applicant.
- If the funded project is one which DELP approved, DPPO notifies DELP so that it may be tracked.



December 31, 1980
NUMBER 5010.36

Department of Defense Instruction

ASD(MRA&L)

SUBJECT: Productivity Enhancing Capital Investment

- References:
- (a) DoD Directive 5010.31, "DoD Productivity Program," April 27, 1979
 - (b) DoD Instruction 5010.34, "Productivity Enhancement, Measurement, and Evaluation - Operating Guidelines and Reporting Instructions," August 4, 1975
 - (c) ASD(MRA&L) Memorandum "DoD Productivity Enhancing Capital Investment (PECI) Program - Fiscal Year 1979," November 11, 1978 (hereby canceled)
 - (d) through (s), see enclosure 1

A. PURPOSE

This Instruction establishes policy and prescribes procedures for the DoD Productivity Enhancing Capital Investment (PECI) program; incorporates changes resulting from the revision of reference (a); includes requirements established by Congress; complies with the provisions of the Federal Productivity Program established by the Office of Personnel Management (OPM); consolidates guidance contained in references (b) and (c); and assigns responsibilities for the overall administration of the program. Reference (c) and enclosure 2 to reference (b) are hereby canceled.

B. APPLICABILITY AND SCOPE

1. The provisions of this Instruction apply to the Office of the Secretary of Defense (OSD), the Military Departments, the Organization of the Joint Chiefs of Staff, and the Defense Agencies (hereafter referred to as "DoD Components").

2. These provisions encompass the acquisition or lease of equipment and facilities to improve the productivity of defense activities. This includes major facilities, equipment or process modernization efforts, as well as efforts to improve the performance of individual jobs, tasks, or operations.

3. Investments at government-owned, contractor-operated (GOCO) facilities are excluded from the provisions of this Instruction.

C. DEFINITIONS

Terms used in this Instruction are defined in enclosure 2.

D. OBJECTIVES

The objectives of the DoD Peci program are to:

1. Improve the efficiency and effectiveness of defense organizations and activities by encouraging the application of capital equipment and facilities to improve methods of operation.
2. Increase the level of consciousness among defense managers of the potential for productivity improvement through capital investments.
3. Promote the substitution of capital for labor as a means of optimizing the output of the defense work force.

E. POLICIES

1. Managers at all levels shall be encouraged to aggressively seek out and identify opportunities for PEGI and be supported in their efforts to finance and acquire these investments.
2. The PEGI program is an element of the DoD Productivity Program established by DoD Directive 5010.31 (reference (a)). PEGIs shall be made in consonance with other productivity efforts and shall be an integral part of DoD Component investment planning.
3. PEGIs shall be carried out within restrictions established by public law, DoD policies, and other regulatory constraints.
4. Capital-labor substitution through productivity enhancing investment and leasing actions shall be exploited as a primary means for improving the labor productivity of defense organizations and operations.
5. OSD-established PEGI funding procedures focus upon financing those projects that substitute capital for labor. DoD Components are encouraged to establish complementary programs to finance other deserving PEGI projects.
6. Top priority shall be given to those potential investments that amortize in the shortest period of time and those with the highest potential internal rate of return (IRR) on investment or highest net present value (NPV). For projects having identical IRRs or NPVs, proposals will be ranked for financing in the following order of priorities:
 - a. Projects that save whole personnel spaces or authorizations that can be reapplied at the local level.
 - b. Projects that save whole personnel authorizations that cannot be reapplied to perform other valid requirements at the local level, but can be reallocated to other activities as priorities dictate.
 - c. Projects that avoid overtime personnel costs or release work hours and personnel to be reapplied to other uses.
 - d. Projects that save consumable materials.
 - e. Projects produce other cost savings which can be reapplied to valid unfinanced requirements.

7. Productivity enhancing capital equipment and facilities shall be leased rather than purchased when such action is cost effective or appropriate. Leasing is particularly appropriate for areas of fast changing technology or when workloads are expected to cease before the end of the program period. Leasing may also be used as a means of obtaining near-term benefits from productivity improvement opportunities until sufficient data to verify the benefits of procurement can be developed.

8. DoD Component PECE programs shall provide incentives for program participation at all levels. As an incentive to identify PECE opportunities, the reuse of all or part of the benefits from PECE should be permitted where practicable. Benefits may be used to reduce backlogs without reducing resources, either to reduce resource requirements in annual budgets, or to support valid unfunded requirements during the operating budget year. Reuse should be at the level that creates an incentive for management participation in the program.

9. All individuals or groups who identify PECE opportunities that result in savings or improvements in productivity or who aggressively promote PECE initiatives within their organizations shall be recognized through the DoD Incentive Awards Program, DoD Instruction 5120.16 (reference (d)), performance appraisal, or by other appropriate means.

10. Planned PECE actions and expected benefits shall be documented and reported throughout the Planning, Programming and Budgeting System (PPBS) (DoD Instruction 7045.7, reference (e)).

F. CRITERIA

1. PECEs are investments in facilities and equipment that improve the relationship between the outputs (products and services) and the inputs (labor, material, and services including energy consumption) of an organization or function. Projects that merely alter the existing method of financing for equipment or facilities, such as, buying rather than leasing, do not qualify as PECEs. PECEs financed through Productivity Enhancing Incentive Funds (PEEIF) will not be used to purchase equipment being operated under lease agreements or contracts unless: (1) productivity benefits, in addition to reduction in leasing costs, can be realized through improvements in methods, processes or procedures; or (2) leasing arrangements were initially established on a temporary basis contingent upon verifying potential of the investment to achieve productivity gains. Project benefits in constant prices shall be discounted over the expected payback period of the PECE to the date of initial operation. Should they equal or exceed total investments costs, then the project may be approved for funding. The discount rate to be used in this determination is that rate recommended in DoD Instruction 7041.3 (reference (g)) or other appropriate guidance.

2. PECEs are classified for the purpose of aggregation in reports or financial documents as: (a) OSD-sponsored projects (b) Industrial Fund Fast Payback (IFFP) projects; or (c) Other Component-Sponsored Investment (CSI) projects.

3. OSD-sponsored projects include but are not limited to:

a. Productivity Enhancing Incentive Fund (PEIF) projects. PEIF projects are fast payback PECI projects financed from drawing accounts established within annual appropriations. These projects cannot exceed \$100,000 or cost limitations established by OSD (whichever is greater) and must be expected to amortize within 2 years of the date they become operational.

b. Productivity Investment Fund (PIF) projects. PIF projects are PECI projects that have been competitively selected by OSD from candidate proposals submitted by DoD Components and financed through traditional budget appropriation processes from funds set aside by OSD for this purpose. PIF projects must be expected to amortize within 4 years of the date they become operational. PIF project proposals must also conform to additional selection criteria (if any) as established annually by ASD(MRA&L).

4. Specific criteria for IFFP projects are provided in DoD Directive 7410.4 (reference (h)) and DoD Instruction 7410.5 (reference (i)).

5. CSI projects, including fast payback investments, may have longer payback periods or different cost or benefit criteria than those specified in this Instruction for PEIF or PIF projects. Such projects are encouraged. Specific criteria shall be developed by the sponsoring DoD Components and promulgated after review and approval by OASD(MRA&L).

G. PROCEDURES

The following procedures shall be followed by DoD Components in the identification, documentation, selection, and financing of PECI projects:

1. Each PECI project proposal shall be reviewed prior to approval and funding to ensure that it:

a. Is a desirable action and meets the Component long-range planning and programing objectives.

(1) Is needed to perform valid operations, functions, or services (as established by assigned missions and workloads) that cannot be performed as effectively or economically by the use of existing facilities or by contract, in accordance with DoD Directive 4100.15 and DoD Instruction 4100.33 (references (j) and (k)).

(2) Complies with policies and regulations governing the acquisition and management of facilities, special tooling, and special test equipment as established by DoD Directive 4275.5 (reference (l)) and DoD Instructions 4270.24 and 7040.4 (references (m) and (n)), and with all other policies and regulations governing the lease and acquisition of equipment and facilities.

b. Is subjected to economic analysis in accordance with DoD Instruction 7041.3 (reference (g)).

c. Has complete documentation to facilitate preinvestment analysis and postinvestment evaluation. A suggested format for documentation of PECI projects is provided as enclosure 3.

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2. Resources for PEIF and other CSI projects shall be included in Program Objective Memoranda (POMs) and in budget submissions. The level of funding shall be established in consonance with productivity plans and goals developed in accordance with DoD Directive 5010.31 (reference (a)) and DoD 7110.1-M (reference (o)).

3. Guidelines for the management of PEIF and PIF projects, including procedures for documentation, preinvestment analyses, financing, and post-investment accountability are provided as enclosure 4. The use of these guidelines for documenting IFFP and CSI projects is encouraged.

4. All PECI projects shall be monitored on a periodic basis following the acquisition and installation of equipment to ensure that expected productivity benefits and objectives are achieved.

5. Special accountability procedures shall be initiated and information maintained on a project-by-project basis for all PECIs. At a minimum, information shall be available to:

- a. Verify the obligation and expenditure of funds and costs incurred for approved projects.
- b. Identify the amount and the disposition or reapplication of savings achieved and evaluate productivity improvements.
- c. Provide a comparison of net benefits achieved with net benefits predicted in project justifications.
- d. Identify project or program deficiencies and corrective actions taken.
- e. Provide for audit of projects and for reports required by the OSD, the Congress, or other federal agencies.

6. PECIs shall be subject to audit in accordance with the policies and procedures established in DoD Instruction 7600.3, reference (p).

H. RESPONSIBILITIES

1. The Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) ASD(MRA&L) shall:

- a. Develop policies and programing guidance for the overall DoD PECI Program.
- b. Administer the overall program in accordance with responsibilities delineated in DoD Directive 5010.31 (reference (a)).
- c. Maintain liaison with the Secretaries of the Military Departments and the Directors of the Defense Agencies to ensure compliance with this Instruction.

d. Coordinate PEGI efforts with the Under Secretaries and Assistant Secretaries of Defense and the Chairman of the Joint Chiefs of Staff in matters that affect their particular areas of responsibility.

e. In coordination with the Assistant Secretary of Defense (Comptroller), recommend for approval of the Secretary or Deputy Secretary of Defense all PEGI proposals to be financed from PIF.

2. The Assistant Secretary of Defense (Comptroller) (ASD(C)) shall:

a. Issue guidance and procedures for PEGI financing and for PEGI identification in DoD Component budget requests.

b. Ensure compliance with DoD Directive 5000.19, reference (q).

3. The Defense Productivity Principal designated by ASD(MRA&L) in accordance with DoD Directive 5010.31, reference (a), shall:

a. Provide technical guidance and support for the DoD PEGI program.

b. Monitor and evaluate DoD Component PEGI efforts.

c. Review all PEGI project proposals to be financed through PIF and advise the ASD(MRA&L) of appropriate actions.

d. Analyze PEGI data reported by the DoD Components and compile information that reflects the status and results of PEGI efforts as a part of annual productivity reports to the Bureau of Labor Statistics and to the Congress.

e. Identify policy or implementation deficiencies requiring ASD(MRA&L) or ASD(C) attention and formulate recommendations for corrective action.

4. The Secretaries of the Military Departments and the Directors of the Defense Agencies shall:

a. Develop and sustain a formal PEGI Program that:

(1) Emphasizes the improvement of day-to-day operations through facility modernization and capital-labor substitution.

(2) Provides motivation and opportunities for personnel at all levels to improve work processes and to reduce manpower resource requirements on a continuing basis through PEGI.

(3) Includes a balanced approach consisting of PEIF, PIF, IFFP and CSI projects.

b. Establish procedures ensuring that the policies contained in this Instruction are implemented.

c. Designate an individual or central point of contact who shall be responsible for program management and who shall coordinate overall PEGI efforts on a DoD Component-wide basis.

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d. Ensure that PECIs are included and identified in programing and budgeting documents.

I. INFORMATION REQUIREMENTS

1. The Department of Defense is required by Congress and by the Executive Office to provide information annually on DoD productivity improvement efforts and on the investments made through PEIF. To comply with these requirements, information on PEIF and PIF projects shall be maintained at DoD Component headquarters level to respond to these requirements and to evaluate the efficacy of Component PECI programs. Components are encouraged to maintain similar information on IFFP and other CSI PECIs and to include this information in reports to OSD and to the Congress.

2. Enclosure 5 details information to be included as a part of annual budget submissions as required by DoD 7110.1-M, reference (o), or in the annual productivity report (Interagency Report Control Number 0169-OPN-AN). Information required by Enclosure 5 shall be provided to ASD(MRA&L) not later than January 1 of each calendar year.

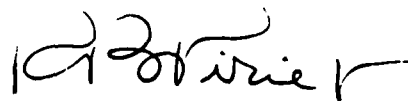
3. The information requirements of enclosure 3 have been assigned Report Control Symbol DD-M(A)1561. Information required in enclosure 3 shall be provided for PIF projects to be considered for funding by the OSD from programed PIFs.

4. Additional information may be required in accordance with programing guidance issued by OSD or POM preparation instructions.

5. To the extent practicable all information on PECI effort shall be extracted from existing accounting and management information systems, using data elements and codes from DoD 5000.12-M reference (r). Existing systems shall be modified to accommodate this. In no event should a special, separate system be established.

J. EFFECTIVE DATE AND IMPLEMENTATION

This Instruction is effective immediately. Forward two copies of implementing documents to the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) within 180 days.



Robert B. Pirie, Jr.
Assistant Secretary of Defense
Manpower, Reserve Affairs, and Logistics

Enclosures - 5

1. References
2. Definitions
3. Instruction for Completing PECI Documentation Format
4. Guidelines for Managing and Evaluating OSD Sponsored Capital Investment Projects
5. Procedures for Reporting

REFERENCES, continued

- (d) DoD Instruction 5120.16, "Department of Defense Incentive Awards Program: Policies and Standards," July 15, 1974
- (e) DoD Instruction 7045.7, "The Planning, Programming and Budgeting System," October 29, 1969
- (f) DoD Directive 7000.1, "Resource Management Systems of the Department of Defense," August 22, 1966
- (g) DoD Instruction 7041.3, "Economic Analysis and Program Evaluation for Resource Management," October 18, 1972
- (h) DoD Directive 7410.4, "Regulations Governing Industrial Fund Operations," September 25, 1972
- (i) DoD Instruction 7410.5, "Financial Reports for Department of Defense Industrial Funds" January 3, 1975
- (j) DoD Directive 4100.15, "Commercial and Industrial-Type Activities," February 4, 1980
- (k) DoD Instruction 4100.33, "Operation of Commercial and Industrial-Type Activities," February 25, 1980
- (l) DoD Directive 4275.5, "Acquisition and Management of Industrial Resources," October 6, 1980
- (m) DoD Instruction 4270.24, "Minor Construction and Restoration or Replacement of Facilities Damaged or Destroyed," October 16, 1978
- (n) DoD Instruction 7040.4, "Military Construction Authorization and Appropriation," March 5, 1979
- (o) DoD 7110.1-M, "DoD Budget Guidance Manual," July 7, 1978, authorized by DoD Instruction 7110.1, October 30, 1980
- (p) DoD Instruction 7600.3, "Internal Audit in the Department of Defense," January 4, 1974
- (q) DoD Directive 5000.19, "Policies for the Management and Control of Information Requirements," March 12, 1976
- (r) DoD 5000.12-M, "DoD Manual for Standard Data Elements," June 30, 1980, authorized by DoD Instruction 5000.12, April 27, 1965
- (s) DoD 4000.19-M, "Defense Retail Interservice Support (DRIS) Manual," September 1978, authorized by DoD Directive 4000.19, October 14, 1980

DEFINITIONS

- A. Capital Investment. The acquisition, installation, transportation and other costs needed to place equipment or facilities in operation meeting DoD capitalization requirements.
- B. Capital-labor Substitution. The employment of capital over a given period either as an investment or to acquire a service or product rather than employ personnel in the accomplishment of an operation or mission during the same period.
- C. Component Sponsored Investments (CSI). PEI financed through funding provided by DoD Components programs and included in appropriations in response to DoD Component initiated budget requests for specific items.
- D. Economic Life. The period of time over which the benefits to be gained from a project may reasonably be expected to accrue to the Department of Defense (see enclosure 3 of reference (g), DoD Instruction 7041.3).
- E. Internal Rate of Return. The discount rate that equates the present value of the future cash inflows with the present value costs of an investment.
- F. Net Present Value of Investment. The difference between the present value benefit and the present value cost at a given discount rate.
- G. Off-the-Shelf. Equipment that is readily available through government or commercial sources or that can be fabricated through combination or modification of existing equipment without extensive research and development effort.
- H. Payback Period. The number of periods required for the (undiscounted) cumulative cash inflow to have the same value as the investment cost.
- I. Productivity Enhancing Capital Investment (PECI). A capital investment in equipment or facilities that will improve the ratio of units of output to units of input of an organization or function.
- J. PECI, Fast Payback. A PEI that will pay for itself within a short period. For those Fast Payback PECIs financed from PEIFs, the maximum payback period is 2 years. For those financed from Industrial Funds, the maximum payback period is 3 years. Component-sponsored fast payback project payback period should not exceed 3 years.
- K. PECI Savings. Benefits resulting from PECIs that can be reflected as reductions in personnel, material or services costs incurred.
- (1) Hard Savings. Benefits that can be precisely measured, quantified, and placed under management control at time of realization. Hard savings normally are applied as specific reductions in manpower and budget dollar requirements.
- (2) Cost-Avoidance Savings. Benefits from actions that obviate the requirements for an increase in future levels of manpower or costs that would be necessary if present management practice were continued. The effect of

cost-avoidance savings is the achievement of a given level of readiness at less staffing cost or the absorption of a growing workload at the same level of staffing or cost. Cost-avoidance savings may be included as supporting documentation for resource (manpower or dollars) requirements computations in annual budgets.

(3) Opportunity Trade-off Savings. Benefits that occur as a result of selecting the least-cost alternative from among alternative choices. These savings occur by avoiding the loss of an opportunity to enhance productivity and accrue benefits by choosing one course of action over another. Opportunity trade-off savings are often used to document the need for a productivity enhancement action or as a factor in marginal analyses.

L. Productivity Investment Funds (PIF). Funds initiated through OSD program and budget guidance to finance competitively selected PECIs. To qualify for PIF financing, projects are expected to have payback periods of 4 years or less.

M. Productivity Enhancing Incentive Funds (PEIF). Special funds established to provide timely financing for fast payback Peci opportunities. To qualify for PEIF financing, projects are expected to have payback periods of 2 years or less and must meet the criteria established in this instruction.

INSTRUCTIONS FOR COMPLETING
PECI DOCUMENTATION FORMAT

A. GENERAL

1. The information to be provided in the capital investment documentation is designed to provide minimal data essential to the preinvestment analysis of individual project proposals. The use of this format is mandatory for all PIF project proposals submitted to OASD(MRA&L). It is also suggested for use in documenting PEIF proposals and other capital investment proposals. The use of uniform documentation will improve program management at all levels and should facilitate postinvestment appraisal.

2. Coding must be as indicated in these instructions. In cases where specific coding instructions are not provided, reference must be made to DoD 5000.12-M reference (r). Items marked with an asterisk (*) have been registered in the DoD Data Element Program. Failure to comply with either the coding instructions contained herein or those published in the DoD 5000.12-M will mean that project proposals will not be considered by OASD(MRA&L).

3. All PIF project proposals will be signed by the proposing individual and by an official authorized to approve its submission to OASD(MRA&L) for consideration. DoD Component offices serving as central points of contact for the DoD PEFI effort will have access to all documentation pertaining to individual proposals and are responsible to review proposals for accuracy, completeness, and adherence to established criteria prior to their submission to OSD.

B. INFORMATION REQUIRED

<u>ITEM NO.</u>	<u>INFORMATION TO BE ENTERED</u>
1. <u>Project No.</u>	Assign the DoD Component number. This number may consist of up to 6 alphanumeric characters.
2.* <u>DoD Component Name</u>	Enter the name of the DoD Component submitting this project. Reference Data Element DE-NM, from DoD 5000.12-M, reference (r).
3.* <u>DoD Component Code</u>	Enter the single character alpha code designating the submitting Component identified in DoD 5000.12-M, reference (r). Reference Data Element DE-NM (Attachment 1).

- 4.* Command Code Enter the six-character alpha numeric code identifying the major subordinate command within the DoD Component to which the submitting unit or activity is assigned. (see DoD 4000.19-M, appendix III (reference (s))).
- 5.* Date Enter the date on which this project was submitted by proposer to OSD (or to component command) for approval. Reference data element DA-FA-AF, DoD 5000.12-M, reference (r).
6. Project Title In 25 alphanumeric characters or less, describe or identify the project. Title should, if possible, indicate type of equipment or facilities included in project.
- 7.* Type of PECE Project Check appropriate block to indicate whether this project is one which will be financed through
- a. PEIF
 - b. PIF
 - c. IFFP
 - d. CSI
8. Functional Area Where savings List the name of the functional area where the benefits derived from this investment will occur. Functions are those identified in enclosure 3 of DoD Instruction 5010.34, reference (b). If the appropriate function is not listed in this enclosure, list the function involved and explain in Item 16.
- 9.* Economic Life List in years the estimated economic life of the project. Reference Data Element 10-TT-28-AA, DoD 5000.12-M, reference (r).
- 10.*Expected Operational Date Enter the year and month that this project is expected to become fully operational, such as when all installation, debugging, and pre production actions have been taken. Reference Data Element DA-FA-AA, DoD 5000.12-M, reference (r).

11. *Name of Submitting Unit List the name of the activity submitting this proposal. The activity listed should be the activity, installation, or unit responsible for installing, operating, and receiving benefits from this proposed investment. If this project includes investment at more than one activity, identify the numbers and types of activities (such as, 6 Naval Supply Centers).
- 12* Unit ID Code(s) Individual DoD Components have established a unique 6 character Unit Identification Codes (UIC) for each activity. Enter, the UIC for the submitting unit or units listed in (11).
13. Project Description Describe the nature of the project in nontechnical terms. Indicate what equipment or facilities will be acquired, how they will be used, and how productivity will be improved.
14. Detailed Justification Briefly describes the specifics, in terms of summary costs and benefits, used to amortize this project. This should include significant changes from present processes or operations and expected results. Detailed breakdown of costs and benefits may be provided as attachments to the project documentation.
15. Savings Disposition Indicate the planned disposition of project benefits, by function or program element. Indicate whether they to are be reapplied within the same program, to be reprogramed, or used to reduce specific budget requirements. Where known, deferred workloads in area of reapplication should be quantified.
16. Other Remarks This space should be used to provide other pertinent information that will affect the consideration of the project. Items such as backlogs, manpower constraints, or mission or program priorities that will be affected by the project may be included. Intangible benefits (improved timeliness, quality, or mission effectiveness) may be described. Remarks should be concise and cogent.

17. Investment Data

This section will be used to quantify information relating to the investment costs.

- *a. Fiscal Year (FY). Enter the appropriate fiscal year for each row of data. Reference Data Element YE-NA-FY, DoD 5000.12-M, reference (r).
- b. Appropriation and Budget Activity. List the appropriation or fund and the budget activity (facilities category for military construction appropriations) in which funds will be requested for this project. For the procurement appropriations, line items will be shown (except for PIF projects). For the RDT&E appropriations, program elements will be shown.
- *c. Acquisition Cost. Identify, in thousands of dollars to the nearest tenth, the expected acquisition cost of the equipment and facilities in the appropriate fiscal year row. Reference Data Element MO-CH-AA, reference (r).
- *d. Installation Cost. List, in thousands of dollars to the nearest tenth, the expected cost of project installation that will be financed not included in acquisition cost regardless of funding. Amounts should be entered in the row corresponding with item (b). Reference Data Element MO-AI-AA, reference (r).
- *e. Transportation Costs. List in thousands of dollars to the nearest tenth, the expected costs of transportation not included in Acquisition Cost, item 17.c. Reference Data Element MO-AI-AA, reference (r).
- *f. Other Costs. List, in thousands of dollars to the nearest tenth, the expected costs (training, start-up), that will be incurred by this project before it can become fully operational. Exclude normal operational costs that will be accounted for by computing the net benefits to be listed in item 18.a. and 18.b.. Reference Data Element MO-AI-AA, reference (r).

18. Net Benefit Data

Use this section to document net benefits that are quantifiable in dollars. All entries will relate to the fiscal year listed in 17.a..

- *a. Total Savings. List, in thousands of dollars to the nearest tenth, the expected value of the benefits to be derived from this project, after operating costs have been deducted. In those instances where operating costs exceed gross benefits, a negative (-) entry will be shown. Reference Data Element MO-DY-AA, reference (r).
- *b. Labor Savings. List, in thousands of dollars to the nearest tenth, the expected value of the personnel savings reported in 18.c. and d.. Reference Data Element MO-DY-AA, reference (r).
- *c. Personnel Savings (Authorizations). List the whole personnel spaces saved by this project. These spaces are those that are no longer required to perform the operations affected by the investment and can be transferred to another specific assignment. Reference data Element 10-TT-28-AB, reference (r).
- *d. Personnel Savings (Equivalents). List the personnel space equivalents that result from converting workhours or workdays saved by this project. Include savings which reduce validated requirements for which authorization have not been formally established. Personnel avoidance savings may also be included. Reference Data Element 10-TT-28-AA, reference (r).

19. *Point of Contact Enter the last name, first name, and middle initial of the individual submitting the original proposal for this project. If the proposal is being proposed by a group of individuals or an organization, identify in this space the name of the point of contact for further information on the project. Reference NA-RG-AA, reference (r).
20. *Date Enter the date that this project was originally submitted by the proposing individual. Reference Data Element DA-FA-AF, reference (r).
21. Phone Enter the official work telephone number of the individual listed in item (19) above. Identify Area Code Number or AUTOVON Number, telephone number, and extension number.
22. * Name of Approving Official Enter the name of the official who has approval authority, within the submitting DoD Component, to approve the project either for

authorization of funds or for submission to OSD
for funding consideration. Reference NA-RG-AA,
reference (r).

23.* Date

Enter the year, month, and day approval was granted.
Reference Data Element DA-FA-AF, reference (r).

DOCUMENTATION FORMAT FOR
PRODUCTIVITY ENHANCING CAPITAL INVESTMENTS

1. <u>Project No.</u>	2. <u>Dod Component Name</u>	3. <u>Dod Component Code</u>	4. <u>Command Code</u>	5. <u>Date (YYMMDD)</u>
6. <u>Project Title</u>				
7. <input type="checkbox"/> PEIF <input type="checkbox"/> PIF <input type="checkbox"/> IFFP <input type="checkbox"/> CSI <input type="checkbox"/> Other (Type of PEGI Project - Check one.)				
8. <u>Functional Area Where Savings Will Occur</u>	9. <u>Economic Life (In Years)</u>	10. <u>Expected Operational Date (YYMM)</u>		
11. <u>Submitting Unit (s)</u> <u>Unit Identification Code (ULC)</u>				
13. <u>Project Description:</u>				
14. <u>Detailed Justification:</u>				
15. <u>Savings Disposition:</u>				
16. <u>Other remarks:</u>				

FY 19

ANNUAL PRODUCTIVITY REPORT - PRODUCTIVITY ENHANCING CAPITAL INVESTMENTS

FOR
(DoD Component)

<u>PEICs - OTHER THAN FAST PAYBACK</u>		<u>FAST PAYBACK PEICs</u>	
<u>PIF</u>	<u>CSI</u>	<u>PEIF</u>	<u>Industrial Fund</u>

1. No. of Projects (CFY)
2. Total Investment Cost (CFY)
3. Other Costs (CFY)
4. Funds Requested (BFY)
5. Estimated Returns (CFY Projects)
 - a. Dollar Savings (Annual)
 - b. Dollar Savings (Project Economic Life)
 - c. Personnel Savings (Personnel Authorizations)
 - d. Personnel Savings (Personnel Equivalents)

DOCUMENTATION FORMAT (Continued)
PRODUCTIVITY ENHANCING CAPITAL INVESTMENTS
ANALYSIS DATA

17. INVESTMENT DATA				18. NET BENEFIT DATA			
(a)	(b)	(c)	(d)	(e)	(f)	(a)	(b)
APPROPRIATION & BUDGET ACT.	ACQUISITION COST (\$000)	INSTALLATION COST (\$000)	TRANSPORTATION COSTS (\$000)	OTHER COSTS (\$000)	TOTAL SAVINGS (\$000)	LABOR & SAVINGS (\$000)	PERSONNEL AUTHORIZATIONS (Nearest .0)
FY							SAVINGS EQUIVALENTS (Nearest .1)

B-23

TOTAL

CERTIFICATION: This project complies with public laws, OSD policies and regulations, and all other regulatory constraints including the provisions of DoD Directives 4100.15 and 4275.5, references (j) and (l) and DoD Instruction 7040.4, reference (n).

SUBMITTED BY:

19. Name of Proposing Individual (Last, First, M.I.)
20. Date (YYMMDD) 21. Phone (Area Code + Number)
22. Name of Approving Official (Last, First, M.I.)
23. Date (YYMMDD)

Dec 31, 80
5010.36 (Encl 3)

PROGRAM ELEMENT CODES (DoD Standard Data Element Reference DE-NM)

The following identifier codes are contained in the position of each program element:

- A - Department of the Army
- B - Defense Mapping Agency
- D - Office of the Secretary of Defense
- E - Defense Advanced Research Projects Agency
- F - Department of the Air Force
- G - National Security Agency
- H - Defense Nuclear Agency
- J - Joint Chiefs of Staff (including the Joint Staff, Unified Specified Commands)
- K - Defense Communications Agency
- L - Defense Intelligence Agency
- M - United States Marine Corps
- N - Department of the Navy
- R - Defense Contract Audit Agency
- S - Defense Logistics Agency
- T - Defense Security Assistance Agency
- U - Defense Audit Service
- V - Defense Investigative Service
- W - Uniformed Services University of the Health Sciences
- Y - Defense Audiovisual Agency
- Z - Department of Defense Dependents Schools

GUIDELINES FOR MANAGING AND EVALUATING
OSD-SPONSORED
CAPITAL INVESTMENT PROJECTS

A. Project Justification and PreInvestment Evaluation

In order that projects submitted for financing from OSD-sponsored funds are evaluated and financed in a uniform manner by all DoD Components, the following guidelines are provided. These guidelines are intended to ensure that each project is adequately documented, effectively evaluated in making optimum allocation of authorized PEIF and PIF monies, and materially contributes to improving the productivity of a function, operation, or organization.

B. Investment Project Criteria

OSD-sponsored capital investments are those investments financed from either the PEIF or through PIF established in defense programing documents.

1. PEIF Projects. Projects financed from PEIF will be limited to:

a. PEICs that cost less than limits established in annual appropriations (or \$100,000 if no cost ceiling is otherwise prescribed) and which are expected to return all investment costs within 2 years from the date it becomes operational.

b. Off-the-shelf commercial equipment.

c. Projects or items not included in other requests for funds in current year budgets or specifically denied by Congress in prior year budget requests.

d. Projects justified on the basis of potential productivity improvement quantified as tangible savings (either personnel dollars or material) realized through changes in operating methods, processes, or procedures.

2. PIF Projects. Projects financed from PIF will be limited to:

a. Those projects considered and approved for inclusion in DoD Component budgets on the basis that:

(1) Proposed project is expected to return all investments costs (acquisition, transportation and installation) within 4 years from the date it becomes operational, through savings measured in budget year prices.

(2) The minimum project cost is at least \$100,000 for projects at nonindustrial-funded activities and at least \$300,000 for projects that meet the criteria for fast payback investments under DoD Directive 7410.4 (reference (h)), at industrial funded activities. Projects need not, be limited to investments at a single activity but may group similar or related items which use the same basis for justification or are for the same functional area.

(3) Projects must be for improvements in functions currently measured under the DoD Productivity Program or for which specific plans

have been made to report in DoD Component productivity data. Measurement should be comprehensive enough to ensure visibility of project benefits within the function. For proposals in unmeasured areas, project submissions should include plans for measurement. Savings from approved projects, however, may be reapplied to either measured or unmeasured functions. This reapplication shall be consistent with the provisions of DoD Directive 5010.3, reference (a).

(4) Funds will not be used for: (a) projects directed at the acquisition and ownership of equipment and facilities currently being leased from the private sector or other government organizations; (b) projects that establish an in-house capability for operations readily and more economically available through commercial contract. (c) investment at GOCO facilities.

3. Project Documentation. Each PIF and PEIF project proposal will be documented in accordance with paragraph G.1.e. and enclosure 3 of this Instruction. Projects will be identified as such on the documentation as either a "PEIF" or "PIF" Project. At a minimum, records of savings for projects will reflect disposition of those savings to the completion of the payback period for the investment.

4. Evaluation of Project Proposals. Project proposals will be reviewed, both at the originating level and at a level other than the originating activity, to ensure that:

a. Each PEIF project satisfies the criteria established in subsection G.1. of this Instruction and section B. of this enclosure, and

b. No other funding exists for this project nor have prior funding requests been specifically denied by Congress or the Office of Management and Budget.

C. Post Investment Accountability. PEIF projects are, by their nature, excluded from OSD and Congressional scrutiny prior to funding authorizations. To assure that only valid projects are financed from PEIF and that benefits projected as a basis for project approval are, in fact, realized and reapplied, each component will ensure fully that accountability in accordance with paragraph G.4 of this instruction, is established in procedures and sustained by appraisal and audit.

1. Project Appraisal. Projects will be monitored on a periodic basis following acquisition and installation of equipment to ensure that expected productivity benefits and objectives are achieved. Appraisals should be performed by both the organization responsible for project installation and by organizations other than the submitting activity to ensure objectivity in appraisal results.

2. Program Procedures. Military Services and Defense Agencies will provide, as a part of PEI program guidance, procedures to ensure that post investment appraisals are performed to the extent necessary to ensure that:

a. Fund allocations are used only to acquire equipment identified in approved project proposals.

b. Productivity improvements predicted in project justification and used as a basis for project selections are, within reasonable limits, being realized in the amount and time expected. Where actual operating conditions have precluded realization of expected benefits, these conditions should be identified and corrective actions initiated.

c. Quantification and disposition of productivity benefits (dollars and personnel) are documented, during the period required to return investment costs, to the degree necessary for post investment appraisal and audit.

3. Provisions for Audit. Each Military Department and Defense Agency will incorporate provisions for appropriate audit of PEI projects in accordance with requirements established in DoD Instruction 7410.5, reference (i). An annual summary of the results of audit performed during the operating year will be provided to ASD(MRA&L) prior to next submission of the Component budget to the Congress.

PROCEDURES FOR REPORTING

A. GENERAL

Information on PECI efforts will be required to satisfy the requirements of the Federal Government productivity program and Congressional requirements. It will also be essential to evaluate the efficacy of DoD Component PECI programs in support of established productivity goals. Specific information reporting requirements are contained in DoD Directives 7410.4 and 4275.5, references (h) and (l). Additional information will be included as a part of the productivity data reported annually by each DoD Component. To comply with these reporting requirements, it is necessary that each DoD Component maintain the following information on a summary and project-by-project basis.

B. INFORMATION REQUIREMENTS

Information requirements relate to three distinct aspects of this instruction: (1) PECI programs and budgets; (2) PECI results; and (3) PEIF.

1. PECI Programs and Budgets. Information will be maintained that reflects PECI plans for the current fiscal year (CFY), the budget fiscal year (BFY), and for the outyears in the Five Year Defense Program. At a minimum, this information will include:

a. Expected investment dollars, by type of investment (subsection F.2. of this Instruction).

b. Expected benefits and savings from these investments on an annual and economic life basis.

c. Levels of funding for PEIF and Industrial Fund PECI programs.

2. PECI Results. Information will be maintained, on a project-by-project basis and by functional and Component summaries, on the actual benefits and savings achieved through PECIs. At a minimum, a record of the benefits will be maintained through the period required to return all investment costs of each project. Benefits will be recorded through the economic life of the projects. At a minimum, information on benefits will include:

a. Actual dollar savings achieved.

b. Manpower savings achieved.

c. Comparisons of actual to projected benefits.

d. Audits performed on PECI projects and programs.

3. PEIF Effort Information on PEIF efforts will be maintained to the extent necessary to satisfy OSD and Congressional requirements. This will include:

- a. Number of projects annually.
- b. Level of funding annually for CFY and BFY.
- c. Dollar value of approved projects annually.
- d. Funds obligated in CFY.
- e. Expected annual benefits (dollars and manpower).
- f. Summary of PEIF program audits.

C. PECI INFORMATION IN ANNUAL PRODUCTIVITY REPORTS

At a minimum, the following will be provided on PEIF and PIF investments as a part of annual productivity reports (RCS 0169-OPM AN). Information included in this report should complement productivity measurement data and be used in analysis of productivity change. Inclusion of information on CSIs and IFFPs is encouraged to provide overall visibility of Component PECI programs. Information reported will be provided in the format shown in Attachment 1 of this enclosure. The Current Fiscal Year (CFY) indicated on this report is the fiscal year completed and the year for which the report is being compiled. The Budget Fiscal Year (BFY) represents CFY + 1. Audit summaries will be provided no later than the submission of this report.

Attachment

APPENDIX C

National Stock Number (NSN), Specification and Number, Item Name for Solvents with R³ Potential.

NOTE: Different NSN for the same solvent refers to different size container.

<u>NSN</u>	<u>SPEC</u>	<u>NOUN</u>
6810-00-038-5216	MIL-C-13246	CRESYLIC ACID, TECH
6810-00-045-3578	O-A-51	ACETONE, TECH
6810-00-075-6875	MIL-E-50011	MONOETHANOLAMINE, TECH
6810-00-112-0715	O-E-751	PETROLEUM ETHER, TECH
6810-00-184-4796	O-A-51	ACETONE, TECH
6810-00-201-0904	O-E-760	ALCOHOL, DENATURED
6810-00-201-0907	O-E-760	ALCOHOL, DENATURED
6810-00-209-8098	MIL-B-4394	BROMOCHLOROMETHANE, TECH
6810-00-222-2725	MIL-D-10662	DICHOROETHANE, TECH
6810-00-222-2742	TT-B-838	N-BUTYL ACETATE, TECH
6810-00-222-2744	TT-B-838	N-BUTYL ACETATE, TECH
6810-00-222-2751	TT-E-781	ETHYLENE GLYCOL MONDETHYL ETHER, TECH
6810-00-223-9066	TT-N-97	NAPHTHA, AROMATIC
6810-00-223-9073	TT-N-97	NAPHTHA, AROMATIC
6810-00-223-9076	TT-N-97	NAPHTHA, AROMATIC
6810-00-224-8353	O-M-232	METHANOL, TECH
6810-00-227-1272	ASTM D 91	NAPHTHA, ALIPHATIC
6810-00-238-8117	TT-N-95	NAPHTHA, ALIPHATIC
6810-00-244-0290	MIL-D-6998	DICHLOROMETHANE
6810-00-244-7637	TT-N-97	NAPHTHA, AROMATIC
6810-00-244-7639	TT-N-97	NAPHTHA, AROMATIC
6810-00-245-6694	TT-E-751	ETHYL ACETATE, TECH
6810-00-245-6695	TT-E-751	ETHYL ACETATE, TECH
6810-00-264-9018	MIL-C-13246	CRESYLIC ACID, TECH

6810-00-265-0664	TT-E-751	ETHYL ACETATE, TECH
6810-00-264-9018	MIL-C-13246	CRESYLIC ACID, TECH
6810-00-265-0664	TT-N-95	NAPHTHA, ALIPHATIC
6810-00-270-6207	MIL-E-50011	MONOETHANOLAMINE, TECH
6810-00-270-9982	O-T-236	TETRACHLOROTHYLENE, TECH
6810-00-275-6010	O-M-232	METHANOL, TECH
6810-00-281-1864	O-A-51	ACETONE, TECH
6810-00-281-2192	MIL-E-50011	TRIETHANOLAMINE, TECH
6810-00-281-2685	ASTM D 304	N-BUTYL ALCOHOL
6810-00-281-2762	TT-M-261	METHYL ETHYL KETONE, TECH
6810-00-281-2763	TT-M-261	METHYL ETHYL KETONE, TECH
6810-00-281-2764	VV-B-231	BENZENE, TECH
6810-00-281-6928	ASTM D 304	N-BUTYL ALCOHOL
6810-00-286-0458	MIL-T-19588	TOLUENE METHYL ISOBUTYL KETONE MIXT
6810-00-290-0046	TT-T-548	TOLUENE, TECH
6810-00-290-0048	TT-T-548	TOLUENE, TECH
6810-00-290-4166	ASTM D 846	XYLENE, TECH
6810-00-357-7979	VV-B-231	BENZENE, TECH
6810-00-394-3555	MIL-P-83800	PROPYLENE GLYCOL, TECH
6810-00-397-3720	MIL-D-6998	DICHLOROMETHANE
6810-00-431-6020	TT-E-776	ETHYLENE GLYCOL MONOBUTYL ETHER, TECH
6810-00-476-5612	MIL-T-81533	TRICHLOROETHANE, TECH
6810-00-476-5613	MIL-T-81533	TRICHLOROETHANE, TECH
6810-00-530-4695	O-C-940	CYCHOHEXYLAMINE, TECH
6810-00-539-9714	O-E-760	ALCOHOL, DENATURED
6810-00-543-7915	TT-I-735	ISOPROPYL ALCOHOL, TECH
6810-00-551-1487	O-T-620	TRICHLOROETHANE, TECH

6810-00-584-4070	ASTM D 846	XYLENE, TECH
6810-00-616-9188	MIL-D-6998	DICHLOROMETHANE
6810-00-663-9417	O-M-232	METHANOL, TECH
6810-00-664-0275	O-T-620	TRICHOLROETHANE, TECH
6810-00-664-0388	O-T-620	TRICHOLROETHANE, TECH
6810-00-664-5278	TT-N-97	NAPHTHA, AROMATIC
6810-00-805-9798	O-C-940	CYCLOHEXYLAMINE, TECH
6810-00-819-1128	O-T-236	TETRACHLOROETHYLENE, TECH
6810-00-823-8011	O-E-760	ALCOHOL, DENATURED
6810-00-855-1158	TT-I-735	ISOPROPYL, ALCOHOL, TECH
6810-00-855-6160	TT-I-735	ISOPROPYL, ALCOHOL, TECH
6810-00-922-0866	MIL-E-50011	MONOETHANOLAMINE, TECH
6810-00-926-8993	TT-I-735	ISOPROPYL ALCOHOL, TECH
6810-00-944-2124	O-E-760	ALCOHOL, DENATURED
6810-00-955-6489	O-E-760	ALCOHOL, DENATURED
6810-00-968-6181	O-E-760	ALCOHOL, DENATURED
6810-01-013-2541	O-T-236	TETRACHOROETHYLENE, TECH
6810-01-089-5514	MIL-I-85470	INHIBITOR, ICING, FUEL SYSTEM
6810-01-097-2020	O-T-236	TETRACHLOROETHYLENE, TECH
6810-01-099-3435	O-T-236	TETRACHLOROETHYLENE, TECH
6810-01-745-5201	O-C-940	CYCLOHEXYLAMINE, TECH
6830-00-104-2654	MIL-M-12218	MONOBROMOTRIFLUOROMETHANE, TECH
6830-00-181-7324	MIL-M-12218	MONOBROMOTRIFLUOROMETHANE, TECH
6830-00-227-0441	BB-F-1421	MONOCHLORODIFLUOROMETHANE, TECH
6830-00-269-4300	BB-F-1421	DICHLOROETERATFLUOROETHANE, TECH
6830-00-285-5887	MIL-B-38741	BROMOCHLORODIFLUOROMETHANE, TECH
6830-00-543-6623	MIL-M-12218	MONOBROMOTRIFLUOROMETHANE, TECH

6830-00-597-6663	MIL-D-4540	DIBROMODIFLUOROMETHANE, TECH
6830-00-882-1794	BB-S-1419	SULFUR HEXAFLUORIDE, TECH
6830-00-965-2309	MIL-B-38741	BROMOCHLORODIFLUOROMETHANE, TECH
6830-00-965-9647	MIL-M-12218	MONOBROMOTRIFLUOROMETHANE, TECH
6830-00-985-7283	BB-S-1419	SULFUR HEXAFLUORIDE, TECH
6830-00-985-7284	MIL-D-4540	DIBROMODIFLUOROMETHANE, TECH
6830-00-171-5854	MIL-B-38741	BROMOCHLORODIFLUOROMETHANE, TECH
6850-00-033-8851	MIL-C-81302	CLEANING COMPOUND, SOLVENT
6850-00-060-5312	MIL-I-276861	INHIBITOR, ICING, FUEL SYSTEM
6850-00-097-9632	O-L-298	LITHOGRAPHIC BLANKET-ROLLER WASH
6850-00-167-4701	MIL-C-81302	CLEANING COMPOUND, SOLVENT
6850-00-174-1806	MIL-A-11755	ANTIFREEZE
6850-00-181-7933	MIL-A-46153	ANTIFREEZE
6850-00-181-7940	MIL-A-46154	ANTIFREEZE
6850-00-209-7947	O-C-1889	CLEANING COMPOUND SOLVENT
6850-00-249-8029	MIL-C-372	CLEANING COMPOUND RIFLE BORE
6850-00-264-5771	MIL-C-7024	CALIBRATING FLUID, AIRCRAFT FUEL SYSTEM
6850-00-264-9037	P-D-680	DRY CLEANING SOLVENT
6850-00-264-9066	MIL-C-6864	CLEANING COMPOUND, SOLVENT
6850-00-269-8388	MIL-C-7024	CALIBRATING FLUID, AIRCRAFT FUEL SYSTEM
6850-00-274-5421	P-D-680	DRY CLEANING SOLVENT
6850-00-280-1751	MIL-T-81772	THINNER ALIPAHTIC POLYURETHANE COAT
6850-00-281-1985	A-A-711	DRY, CLEANING SOLVENT
6850-00-281-3042	P-C-111	CARBON REMOVING COMPOUND
6850-00-285-4321	MIL-C-25107	CARBON REMOVING COMPOUND
6850-00-285-8011	P-D-680	DRY CLEANING SOLVENT
6850-00-285-8012	P-D-680	DRY CLEANING SOLVENT

6850-00-291-0964	O-L-298	LITHOGRAPHIC BLANKET-ROLLER WASH
6850-00-292-9700	O-C-1824	CLEANING COMPOUND SOLVENT
6850-00-292-9701	O-C-1824	CLEANING COMPOUND SOLVENT
6850-00-543-7801	MIL-C-19853	CARBON REMOVING COMPOUND
6850-00-550-7453	MIL-C-19853	CARBON REMOVING COMPOUND
6850-00-551-3694	MIL-C-6864	CLEANING COMPOUND, SOLVENT
6850-00-558-1248	MIL-A-8243	DEICING-DEFROSTING AND ANTI-ICING F
6850-00-576-9842	MIL-C-25107	CARBON REMOVING COMPOUND
6850-00-584-4685	MIL-A-8243	DEICING-DEFROSTING AND ANTI-ICING F
6850-00-619-7715	O-C-1889	CLEANING COMPOUND SOLVENT
6850-00-637-6135	P-D-680	DRY CLEANING SOLVENT
6850-00-656-0810	MIL-C-7024	CALIBRATING FLUID, AIRCRAFT FUEL SYSTEM
6850-00-664-1409	A-A-870	ANTIFREEZE
6850-00-664-1409	O-A-548	ANTIFREEZE
6850-00-681-5688	MIL-C-81302	CLEANING COMPOUND, SOLVENT
6850-00-753-4806	MIL-C-372	CLEANING COMPOUND, RIFLE BORE
6850-00-753-5061	MIL-I-27686	INHIBITOR, ICING, FUEL SYSTEM
6850-00-754-2670	MIL-F-27351	CALIBRATING FLUID, AIRCRAFT FUEL SYSTEM
6850-00-764-6999	O-L-298	LITHOGRAPHIC BLANKET-ROLLER WASH
6850-00-803-6420	MIL-C-25107	CARBON REMOVING COMPOUND
6850-00-823-7934	P-D-680	DRY CLEANING SOLVENT
6850-00-901-0591	MIL-A-8243	DEICING-DEFROSTING AND ANTI-ICING F
6850-00-905-9098	MIL-H-81829	HEAT TRANSFER FLUID
6850-00-941-5045	O-C-1889	CLEANING COMPOUND SOLVENT
6850-00-952-7185	O-C-1889	CLEANING COMPOUND SOLVENT
6850-00-965-2323	P-C-111	CARBON REMOVING COMPOUND
6850-00-965-2356	MIL-F-38299	FLUID, PURGING, PRESERVING, FUEL SYSTEM

6850-00-983-0282	MIL-C-81302	CLEANING COMPOUND SOLVENT
6850-00-984-5853	MIL-C-81302	CLEANING COMPOUND, SOLVENT
6850-01-011-8082	MIL-F-38299	FLUID, PURGING, PRESERVING FUEL SYSTEM
6850-01-016-3482	MIL-C-38736	CLEANING COMPOUND, SOLVENT
6850-01-039-3841	MIL-A-8243	DEICING-DEFROSTING AND ANTI-ICING F
6850-01-039-3842	MIL-A-8243	DEICING-DEFROSTING AND ANTI-ICING F
6850-01-060-6398	MIL-C-81302	CLEANING COMPOUND, SOLVENT
6850-01-138-7550	MIL-C-19853	CARBON REMOVING COMPOUND
6850-01-138-7551	MIL-C-19853	CARBON REMOVING COMPOUND
6850-01-157-0749	MIL-T-27686	INHIBITOR, ICING, FUEL SYSTEM
8010-00-027-6428	TT-T-266	THINNER, DOPE AND LACQUER
8010-00-160-5788	A-A-857	THINNER, DOPE AND LACQUER
8010-00-160-5788	TT-T-266	THINNER, DOPE AND LACQUER
8010-00-160-5789	A-A-857	THINNER, DOPE AND LACQUER
8010-00-160-5789	TT-T-266	THINNER, DOPE AND LACQUER
8010-00-165-4447	TT-R-251	REMOVER, PAINT
8010-00-165-5539	MIL-T-6095	THINNER, DOPE AND LACQUER
8010-00-165-5591	MIL-T-6096	THINNER, DOPE AND LACQUER
8010-00-165-5592	MIL-T-6096	THINNER, DOPE AND LACQUER
8010-00-165-5593	MIL-T-6097	THINNER, DOPE AND LACQUER
8010-00-181-8079	MIL-T-81772	THINNER ALIPHATIC POLYURETHANE COAT
8010-00-246-6116	TT-T-291	THINNER, PAINT, MINERAL SPIRITS
8010-00-254-4218	TT-T-306	THINNER, SYNTHETIC RESIN ENAMEL
8010-00-283-051	TT-R-243	REMOVER, PAINT
8010-00-286-2861	TT-R-251	REMOVER, PAINT
8010-00-286-7719	TT-R-243	REMOVER, PAINT
8010-00-431-6212	MIL-R-25134	REMOVER, PAINT

8010-00-431-6213	MIL-R-25134	REMOVER, PAINT
8010-00-515-2258	TT-R-248	REMOVER, PAINT
8010-00-558-7026	TT-T-291	THINNER, PAINT, MINERAL SPIRITS
8010-00-558-7027	TT-T-306	THINNER, SYNTHETIC RESIN ENAMEL
8010-00-926-1488	MIL-R-81294	REMOVER, PAINT
8010-00-926-1489	MIL-R-81294	REMOVER, PAINT
8010-00-926-4728	TT-R-251	REMOVER, PAINT
8010-00-926-4729	TT-R-251	REMOVER, PAINT
8010-00-943-7127	TT-R-248	REMOVER, PAINT
8010-01-021-3320	TT-T-291	THINNER, PAINT, MINERAL SPIRITS
8010-01-035-3356	MIL-R-46116	REMOVER, PAINT
8010-01-040-1059	MIL-R-83936	REMOVER, PAINT
8030-01-066-2876	MIL-R-81834	REMOVER, PAINT
8010-01-069-3056	MIL-R-25134	REMOVER, PAINT
8010-01-168-0080	MIL-R-46116	REMOVER, PAINT
8010-01-168-0684	MIL-T-81772	THINNER, EPOXY

APPENDIX D SOLVENT RECYCLING EQUIPMENT MANUFACTURERS

Artisan Industries, Inc.
73 Pond Street
Waltham, MA 02154
(617) 893-6800

Baron-Blakeslee, Inc.
Subsidiary of Purex Industries
2001 North Janice Avenue
Melrose Park, IL 60160
(312) 450-3900

Brighton Corporation
11861 Mosteller Road
Cincinnati, OH 45241
(513) 771-2300

Buflovak Division
Blaw-Knox food and Chemical Eq. Co.
P.O. Box 1041
Buffalo, NY 14240
(716) 895-2100

Chemetron Process Equipment Div.
Cherry-Burrell Corp.
P.O. Box 35600
Louisville, KY 40232
(502) 491-4310

DCI, Inc.
500 54th Ave., North
St. Cloud, MN 56301
(612) 252-8200

Detrex Chemical Industries, Inc.
P.O. Box 501
Detroit, MI 48232
(313) 358-5800

Dedert Corp.
20000 Governors Dr.
(312) 747-7000

*Finish Engineering Co., Inc.
921 Greengraden Road
Erie, PA 16501
(814) 455-4478

The Kontro Co., Inc.
Orange, MA 01364
(617) 544-2536

LUWA Corp.
P.O. Box 16348
Charlotte, NC 28297-6348
(704) 394-8341

McGill, Inc.
P.O. Box 9667
Tulsa, OK 74157
(918) 445-2431

*Recyclene
405 Eccles Avenue
So. San Francisco, CA 94080
(415) 589-9600

Safety-Kleen Corp.
655 Big Timber Rd.
Elgin, IL 60120
(312) 697-8460

The Phfaudler Co.
P.O. Box 1600
Rochester, NY 14692
(716) 235-1000

UIC, Inc.
P.O. Box 863
1225 Channahon Road
Joliet, IL 60434
(815) 727-5431

Union Carbide Corp.
Dept. K 4436
Danbury, CT 06817
(203) 794-2000

RaySolv, Inc.
225 Old New Brunswick Rd.
Piscataway, NJ 08854
(201) 981-0500

*LISTED on GSA Schedule

APPENDIX E

APPROXIMATE UNIT COST OF VIRGIN SOLVENT

<u>SOLVENTS</u>	<u>COST (Per gal.)*</u>
Acetone	\$ 2.35
Ethanol, 190 Proof	1.31
Ethanol, 200 Proof	3.29
Ether	1.28
Ethyl Acetate	3.08
Heptane	7.71
Hexane	7.23
Methylene Chloride	3.93
Toluene	1.74
Triacetin	8.01
Trichloroethane	3.48
Trichloroethylene	3.22
Trichlorotrifluoroethane (FREON 113)	13.00

* As of August 1984.

APPENDIX F

SOLVENT R³ SUPPLIERS AND RECLAIMERS

ACME SOLVENT RECLAIMING
1915 - 20th Avenue
Rockford, IL 61108
815-397-0298
- Vito Pumilia

AMERICAN CHEMICAL SERVICE, INC.
Colfax Avenue
Griffith, IN 46319
219-924-4370
- James Tarpo

ALL-WORTH, INC.
500 Medco Road
Birmingham, AL 35217
205-841-1707
- Leslie Allen

ALTERNATE ENERGY RESOURCES
2736 Walden Drive
Augusta, GA 30904
404-738-1571
- Millard Vernon

ANACHEMIA SOLVENTS LTD.
3549 Mavis Road
Mississauga, Ontario
Canada L5C1T7
416-279-5122
- Jack McGregor

ARIVEC CHEMICALS, INC.
P.O. Box 54
Douglasville, GA 30133
404-942-4332
- James Parivechio

BARON-BLAKESLEE DIVISION
2001 N. Janice Avenue
Melrose Park, IL 60160
312-450-3900
- William Uffer

BERKLEY PRODUCTS CO.
405 S. 7th Street
Akron, PA 17501
717-859-1104
- John A. Parmer

BROWNING-FERRIS INDUSTRIES, INC.
P.O. Box 3151
Houston, TX 77001
713-870-8100
- Jack Lurcott

CHEMICAL PROCESSORS, INC.
5501 Airport Way South
Seattle, WA 98108
206-767-0350
- Ron West

CHEMICAL RECOVERY SYSTEMS
36345 Van Born Road
Romulus, MI 48174
313-326-3100
- Peter J. Shagena

CHEMICAL SOLVENTS
3751 Jennings Road
Cleveland, OH 44109
216-741-9310
- Ron Forster

CHEMICAL WASTE MANAGEMENT, INC.
3003 Butterfield Road
Oak Brook, IL 60521
312-654-8800
- Donald Price

CHEM-SECURITY SYSTEMS, INC.
P.O. Box 1866
Bellevue, WA 98009
206-827-0711
- Kathleen Neisen

CLAYTON CHEMICAL CO.
#1 Mobile Street
Sauget, IL 62201
618-271-0467
- Bud Haney

CUSTOM ORGANICS, INC.
1445 West 42nd Street
Chicago, IL 60609
312-247-2828
- Dr. Gil Gavlin

EMPAK, INC.
2000 West Loop South
Houston TX 77027
713-623-0000
- Tom Noll

ENERCON SYSTEMS, INC.
16113 Puritas Avenue
Cleveland, OH 44135
216-267-0555
- David Hoecke

ENVIRITE
Norristown & Narcissa Roads
Blue Bell, PA 19442
215-825-2100
- Dr. Ken Whittle

ENVIRONMENTAL PROCESSING SERVICES
1288 McCook Avenue
Dayton, OH 45404
513-222-1062
- Bill Cernetic

ENVIRONMENTAL WASTE REMOVAL, INC.
130 Freight Street
Waterbury, CT 06702
202-755-2283
- Marcel Veronneau

ENVIROSAFE SYSTEMS, INC.
115 Gibraltar Road
Horsham, PA 19044
215-441-5900
- C. Edward Ashby

FISHER-CALO CHEMICALS AND SOLVENTS
600 W. 41st Street
Chicago, IL 60609
312-254-5222
- R. A. McGrenera

FOREMOST-McKESSON
6363 Clark Avenue
Dublin, CA 94566
415-828-1440
- M. Dale Sands

LIBERTY SOLVENTS & CHEMICAL CO.
9429 Ravenna Road
Twinsburg, OH 44087
216-425-4484
- Donald E. McQueen

GANNON CO., INC. G.M.
3134 Post Road
Warwick, RI 02886
401-738-2200
- Gerald M. Gannon

GENERAL CHEMICAL
P.O. Box 608
Framingham, MA 01701
617-872-1202
- Fred Gardner

GENSTAR CONSERVATION SYSTEMS
177 Bovet Road, #550
San Mateo, CA 94402
415-570-6211
- Ted Rattray

HUKILL CHEMICAL CORP.
7013 Krick Road
Bedford, OH 44146
216-232-9400
- Peggy Mask

HYDRITE CHEMICAL CO.
150 W. Donkle Street
Cottage Grove, WI 53527
608-257-5892
- Jim Gourley

INDUSTRIAL SOLVENTS & CHEMICAL CO.
P.O. Box 158
Emissville, PA 17318
717-938-4621
- A. Rawicz

INLAND CHEMICAL CORP.
127 W. Berry Street
Ft. Wayne, IN 46802
219-424-1940
- Hap Murphy/Ken Wiest

KDM CO.
4303 Profit Drive
San Antonio, TX 78219
512-333-4011
- David P. Petersen

PRIDE SOLVENT & CHEMICAL CO.
88 Lamar Street
W. Babylon, NY 11704
516-643-4800
- A.W. Dhom

M&J SOLVENTS CO.
1577 Marietta Road
Atlanta, GA 30325
404-355-8240
- Donald E. McQueen

MARISOL, INC.
125 Factory Lane
Middlesex, NJ 08846
201-469-5100
- Peter Nerser

McCLARY COLUMBIA CORP.
P.O. Box 222
Washoual, WA 98671
206-835-5159
- Jack R. McClary

MILSOLV CO.
P.O. Box 444
Butler, WI 53007
141-252-3550
- C.A. Douthitt

OIL & SOLVENT PROCESS CO.
P.O. Box 907
Azusa, CA 91702
213-334-5117
- Ken O'Morrow

OMEGA CHEMICAL CORP.
12504 E. Whittier Boulevard
Whittier, CA 90602
213-698-0991
- Dennis O'Meara

PERK CHEMICAL CO., INC.
217 South 1st Street
Elizabeth, NJ 07206
201-355-5800
- Ray Rothschild

SEABOARD CHEMICAL CORP.
5809 Riverside Drive
Jamestown, NC 27282
919-886-4804
- Bob Cottam

JOHN SEXTON CONTRACTORS COMPANY
1815 South Wolf Road
Hillside, IL 60162
312-449-1250
- Art Daniels

PRILLAMAN CO.
Fisher Road
Martinsville, VA 24112
703-638-8829
- Nick Prillman, Jr.

RAMSEY CHEMICAL
Route Two, Box 359
Valdosta, GA 31601
912-247-7797
- Fred Ramsey

RHO-CHEM CORP.
425 Isis Avenue
Inglewood, CA 90301
213-776-6233
- Ernest O. Roehl

ROLLINS ENVIRONMENTAL SERVICES, INC.
One Rollins Plaza
Wilmington, DE 19899
302-429-2767
- Richard Sernyak

ROMIC CHEMICAL CORP.
2081 Bay Road
Palo Alto, CA 94303
415-324-1638
- M.H. Schneider

SAFETY KLEEN CORP.
655 Big Timber Road
Elgin, IL 60120
312-697-8460
- Ken Gordon

SCA CHEMICAL SERVICES
2100 Sibley Boulevard
Calumet City, IL 60909
312-646-5700
- Thomas E. Chambers

SYSTECH
245 North Valley Road
Xenia, OH 45385
513-372-8077
513-429-2533
- Gary Smith

TECHTRONICS, INC.
501 Flushing Avenue
Brooklyn, NY 11205
212-624-5240
- Bernard Fleisher

SOLVENTS RECOVERY SERVICE
1200 Sylvan Street
Linden, NJ 07036
201-862-2000
- Steve Jenk

SOLVENT RESOURCE RECOVERY
P.O. Box 453
West Carrollton, OH 45449
513-859-6101
- Tony Kohnen

SOLVENT SERVICE, INC.
1021 Berrvessa Road
San Jose, CA 95133
408-286-6446
- Ed Maionchi

SOUTHEASTERN CHEMICAL & SOLVENTS
170 S. Lafayette Boulevard
Sumter, SC 29150
803-775-2121
- Ronny L. Lowder

SPARTAN CHEMICAL CO.
2539 - 28th Street SW
Wyoming, MI 49509
616-534-4921
- Harry Miller

SPECTRON, INC.
111 Providence Road
Elkton, MD 21921
301-398-1736
- Paul Mraz

WASTE RESEARCH & RECLAMATION CO.
Route #17
Eau Claire, WI 54701
715-834-9624
- Richard S.C. She

TRICIL, LTD.
101 Queensway West, #400
Mississauga, Ontario
Canada L5B2P7
416-270-8280
- Robert Redhead

ULTRA-CHEM
6472 Camden Avenue
Suite 201
San Jose, CA 95120
408-997-0866
- Clyde Scott

UNION CHEMICAL CO., INC.
P.O. Box 423
Union, ME 04862
207-785-2625
- Dr. Esposito

US CHEMICAL CO
29163 Calahan
Roseville, MI 48066
313-778-1414
- Leonard Corachi

US POLLUTION CONTROL
2000 Classen Center, #320
Oklahoma City, OK 73106
405-528-8371
- Herschel Roberts

VAN WATERS & ROGERS
2600 Campus Drive
San Mateo, CA 94403
415-573-8000
- Ronald B. Johnson

ZERO WASTE SYSTEMS, INC.
2928 Poplar Street
Oakland CA 94608
415-893-8257
- Dunkin McElhaney

Appendix G

Safety-Kleen Solvent Systems at DoD Facilities

Case No.: SK-1

Solvent Useage: Degrease Vehicle Parts

Point of Contact: Mr. Earl McCay
DFAE Supply & Maintenance
Bldg 1935
Ft. Sill, OK 73503
(405) 351-4415

Date of Installation: Various

Solvent Use or System
Before Safety-Kleen: Their own units with PD-680

Previous Disposal of
Spent Solvents: Burning or pouring down the drain.
17,000 Gallons/year

Remarks: 13 Safety-Kleen units in place.

Case No.: SK-2

Solvent Useage: Clean Equipment and Motor Pool Vehicles

Point of Contact: MSGT. J.J. Cahill
Langley A.F.B.
Bldg.-621-T-TF W/LGTM
Hampton, VA 23665
(804) 764-2034

Date of Installation: 1-28-83

Solvent Use or System
Before Safety-Kleen: Cold parts cleaner in buckets.
Varsol (PD-680) in Greymill Machine

Previous Disposal of
Spent Solvents: Sent to "Disposal Site"

Remarks: In Vehicle Maint. Bldg. 621

Case No.: SK-3

Solvent Useage: Clean JP-5 Fuel Trucks

Point of Contact: MSGT. J. J. Cahill
Langley A.F.B.
Bldg.-621-T-TF W/LGTM
Hampton, VA 23665
(804) 764-2034

Date of Installation: 1-28-83

Solvent Use or System
Before Safety-Kleen: Buckets and Brushes with
Varsol (PD-680)

Previous Disposal of
Spent Solvents: Sent to "Disposal Site"

Remarks: In Refueling Maint. Bldg. 747

Case No.: SK-4

Solvent Useage: Clean Fire Dept. Truck

Point of Contact: MSGT. J.J. Cahill
Langley A.F.B.
Bldg. -621-T-TF W/LGTM
Hampton, VA 23665
(804) 764-2034

Date of Installation: 1-28-83

Solvent Use or System
Before Safety-Kleen: Buckets and Brushes
with Varsol (PD-680)

Previous Disposal of
Spent Solvents: Drummed and sent to "Disposal Site"

Remarks: Fire Dept. Bldg. 375

Case No.: SK-5

Solvent Useage: Clean Golf Carts
and Tractors

Point of Contact: MSGT. J.J. Cahill
Langley A.F.B.
Bldg. -621-T-TF W/LGTM
Hampton, VA 23665
(804) 764-2034

Date of Installation: 8-28-83

Solvent Use or System
Before Safety-Kleen: Bucket and Brush with
PD-680

Previous Disposal of
Spent Solvents: Drummed and sent to
"Disposal Site"

Remarks: In Golf Course Bldg. 1301

Case No.: SK-6

Solvent Useage: Clean Lawnmower parts

Point of Contact: MSGT. J.J. Cahill
Langley A.F.B.
Bldg. -621-T-TF W/LGTM
Hampton, VA 23665
(804) 764-2034

Date of Installation: 8-28-84

Solvent Use or System
Before Safety-Kleen: Bucket and Brush with
with PD-680

Previous Disposal of
Spent Solvents: Drummed and sent to
"Disposal Site"

Remarks: In Lawnmower Shop. Bldg. 633

Case No.: SK-7

Solvent Useage: Degrease Parts

Point of Contact: Mr. R. L. Barkley, Jr.
Freight Term. Dept.
Code 406 Transport. Div.
Bldg. W-130 Naval Supply
Norfolk VA 23512
(804) 444-5582

Date of Installation: 3-7-84

Solvent Use or System

Before Safety-Kleen: 2-20 Gallon Handi
Kleen Machine, PD-680

Previous Disposal of

Spent Solvents: Sent to "Disposal Site"

Remarks: Previous Cost over \$10/Gallon. Bldgs W-130
and Y202

Case No.: SK-8

Solvent Useage: Degrease Ground
Support Equipm't.

Point of Contact: Master Chief Bear
Work Center 940
Naval Air Station
Norfolk, VA 23511
(804) 444-8821

Date of Installation: 5-2-84

Solvent Use or System

Before Safety-Kleen: 40 Gallon Tank with PD-680

Previous Disposal of

Spent Solvents: Sent to "Disposal Site"

Remarks: 3 Safety-Kleen Units in place

Case No.: SK-9

Solvent Useage: Automotive Parts

Point of Contact: MSGT R.A. Williams
Vehicle Maintenance
England AFB
Alexandria, LA 71301
(318) 448-5563

Date of Installation: 11-2-81

Solvent Use or System
Before Safety-Kleen: Greymill Chest type Units

Previous Disposal of
Spent Solvents: Mixing with contaminated oil -
Final Disposal not known

Remarks:

Case No.: SK-10

Solvent Useage: Maching Shop Parts Cleaning

Point of Contact: Purchasing Department
Army Corps of Engineers
Prytuia and River
Bldg 16
New Orleans, LA 70130
(504) 838-1186

Date of Installation: Various

Solvent Use or System
Before Safety-Kleen: 3 Solvent Cleaning Stations

Previous Disposal of
Spent Solvents: Disposal to Oil Recovery Co.

Remarks: Problem was in getting to talk to proper person

Case No.: SK-11

Solvent Useage: Auto Repair Parts Cleaning

Point of Contact: Mr. James Sarver
Naval Support Bldg #105
(Motor Pool)
Algiers, LA 70146
(504) 361-2230

Date of Installation: 6-27-84

Solvent Use or System
Before Safety-Kleen: Vat of Solvent

Previous Disposal of
Spent Solvents: Disposal to Oil Recovery Co.

Remarks:

Case No.: SK-12

Solvent Useage: General Repair Shop

Point of Contact: LT. J. T. Gunvalson
U.S. Coast Guard
4640 Urquhart
New Orleans, LA 70117
(504) 944-0193

Date of Installation: 2-2-79

Solvent Use or System
Before Safety-Kleen: Unknown

Previous Disposal of
Spent Solvents: Disposal to Oil Recovery Co.

Remarks:

Case No.: SK-13

Solvent Useage: Cleaning Equipment

Point of Contact: Ms. Emily Mullett
U.S. Army Corps of Engr.
109 Research
Harahan, LA 70123
(504) 733-5953

Date of Installation: 2-10-84

Solvent Use or System
Before Safety-Kleen: Open Bucket

Previous Disposal of
Spent Solvents: "Dumpster"

Remarks:

Case No.: SK-14

Solvent Useage: Cleaning parts

Point of Contact: Mr. Larry Burhan
Naval Support (Hobby Shop)
Bldg. 706
Algiers, LA 70146
(504) 361-2135

Date of Installation: 8-6-82

Solvent Use or System
Before Safety-Kleen: Vat of Solvent

Previous Disposal of
Spent Solvents: Disposal to Oil Recovery Co.

Remarks:

Case No.: SK-15

Solvent Useage: Parts washing for vechicles

Point of Contact: Ms. Pam Nelson
Supply Section
Marine Corps Exchange
Camp Pendleton, CA 92055
(619) 725-4595

Date of Installation: 9-10-82

Solvent Use or System
Before Safety-Kleen: Gray Mills & Klear-Flo Machines

Previous Disposal of
Spent Solvents: In fields and lagoons
creating serious problems

Remarks: Approximately 40 unit in service

APPENDIX H

CIVILIAN R³ OF SOLVENTS WITH SMALL STILLs
R - Recyclene, F - Finish

Case No: R-1

Product Manufactured: Plastic Parts

Company Name: L.O.F. Plastics

Point of Contact: Loren Evans
345 East Main St.
Spring Arbor, MI 49283
(517) 750-1610

Solvent/Contaminant: Toluene/Paint

Unit Size, Gallons: 20

Gallons per Month Processed: 380

Remarks: None

Case No: R-2

Product Manufactured: Printer, Plastic
Film & Bags

Company Name: Jaite Pkg.

Point of Contact: Paul Ludwig
1972 Akron Penninsula
Akron, OH 44313
(216) 923-5281

Solvent/Contaminant: Alcohols/ink

Unit Size, Gallons: 70

Gallons per Month Processed: 840

Remarks: Payback less than 2 months

Case No: R-3

Product Manufactured: Fiberglass Tanks

Company Name: Tuflex Inc.

Point of Contact: Tom Sayward
1406 S.W. 8th St.
Pompano Beach, FL 33060
(305) 785-6802

Solvent/Contaminant: Acetone/Resin

Unit Size, Gallons: 35

Gallons per Month Processed: 600

Remarks:

Case No: R-4

Product Manufactured: Labels

Company Name: Rae Label

Point of Contact: Tommy Rae
1414 2nd Ave. S.
Birmingham, AL 35203
(205) 254-3731

Solvent/Contaminant: 75% Perchloroethylene
25% N-Butyl Alcohol/Resin

Unit Size, Gallons: 35

Gallons per Month Processed: 600

Remarks:

Case No: R-5

Product Manufactured: Printer, Packaging Bags

Company Name: Columbus Cellopoly Corp.

Point of Contact: Mike Smith
4041 Roberts Rd.
Columbus, OH 43228
(618) 876-1204

Solvent/Contaminant: Alcohols/ink

Unit Size, Gallons: 35

Gallons per Month Processed: 630

Remarks: "Saving Money"

Case No: R-6

Product Manufactured: Automotive Injection Molder

Company Name: Millington Plastics

Point of Contact: Drew Mooman
500 N. Warpole St.
Upper Sandusky, OH 43351
(419) 294-2317

Solvent/Contaminant: MEK/Resin

Unit Size, Gallons: 70

Gallons per Month Processed: 890

Remarks: Purchasing 2 more units.

Case No: R-7

Product Manufactured: Printing

Company Name: AMKO Plastics Inc.

Point of Contact: Jerry Murray
12025 Tricon Rd.
Cincinnati, OH 45246
(513) 671-1777

Solvent/Contaminant: 75% Perchloroethylene
25% N-Butyl Alcohol/Photo Polymer

Unit Size, Gallons: 35

Gallons per Month Processed: 1260

Remarks:

Case No: R-8

Product Manufactured: Printing

Company Name: Super Pack

Point of Contact: Jim McEnerny
Southampton Industrial Park, PA 18966
(215) 322-1010

Solvent/Contaminant: 75% perchlorethylene
25% N-Butyl Alcohol/Cryel

Unit Size, Gallons: 35

Gallons per Month Processed: 1500

Remarks:

Case No: R-9

Product Manufactured: Aircraft

Company Name: Fairchild Republic

Point of Contact: Tom Webb
Conklin Rd
Farmingdale, N.Y. 11735
(516) 535-0105

Solvent/Contaminant: Lacquer Thinner/paint

Unit Size, Gallons: 14

Gallons per Month Processed: 200

Remarks: Want to purchase a larger unit

Case No: R-10

Product Manufactured: Burglar Alarms

Company Name: ADEMCO

Point of Contact: Carl Johnson
165 Eilgen Way
Syosset, N.Y. 11791
(516) 921-4545

Solvent/Contaminant: 1,1,1,-Trichloroethane/Oil

Unit Size, Gallons: 20

Gallons per Month Processed: 150

Remarks:

Case No: R-11

Product Manufactured: Hydraulic Pumps

Company Name: Sperry Vickers

Point of Contact: Ben Clark
6600 N. 72nd. St.
Omaha, NEB 68122
(402) 571-1000

Solvent/Contaminant: 1,1,1-Trichlorethane/Oil

Unit Size, Gallons: 20

Gallons per Month Processed: 378

Remarks: Previously had 14 gal. still for 18 months.

Case No: R-12

Product Manufactured: Medical Devices

Company Name: USCI/CR BARO Corp.

Point of Contact: Mr. George Ignacio
100 Chelmsford Rd.
H. Billgrica, MA 01862
(617) 658-4997

Solvent/Contaminant: Lacquer Thinner & Xylol/Paint

Unit Size, Gallons: 14

Gallons per Month Processed: 126

Remarks: Pleased with cost savings and hazardous waste reduction.

Case No: R-13

Product Manufactured: Laundry Service

Company Name: Uni First

Point of Contact: Ed Nicholls
15 Olympic Ave.
Woburn, MA
(617) 933-5800

Solvent/Contaminant: 1,1,1-Trichlorethane/ink

Unit Size, Gallons: 20

Gallons per Month Processed: 378

Remarks: Previously had 14 gal. still.

Case No: R-14

Product Manufactured: Coated Metal

Company Name: West Essex

Point of Contact: Harold Asher
8973 Yellow Brick Rd.
Baltimore, MD 21237
(301) 574-8500

Solvent/Contaminant: 1,1,1-Trichlorethane/Oil

Unit Size, Gallons: 20

Gallons per Month Processed: 440

Remarks:

Case No: R-15

Product Manufactured: Silk Screen Printing

Company Name: Gill Studios, Inc.

Point of Contact: Keith Forrest
10800 Lacklan Rd.
Shawnee Mission, KS 66201
(913) 888-4422

Solvent/Contaminant: Xylene/Alcohol and pigment

Unit Size, Gallons: 20

Gallons per Month Processed: 600

Remarks: Also cleaned up 25 drum backlog.

Case No: R-16

Product Manufactured: Trailer Mfg.

Company Name: Freuhauf

Point of Contact: Don Trimbley
11502 1st St.
Omaha, Neb. 68114
(402) 333-4900

Solvent/Contaminant: Paint thinner/paint
Stoddard solv./oil

Unit Size, Gallons: 20, 20

Gallons per Month Processed: 420, 420

Remarks: Both units run every day.

Case No: F-1

PRODUCT: Remanufactured engine parts
COMPANY: R.M.P.
CONTACT: Mr. Bill Sterback
9040 Burrough-Dover Lane
Pennsauken, NJ 08810
(609) 662-3811

SOLVENT/CONTAMINANT: Stoddard solvent/grease
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 3/15/85
REMARKS: "Quite satisfied with unit."

Case No: F-2
PRODUCT: Plastic injection molding
COMPANY: Hoover Universal
CONTACT: Mr. Dan Bevier
8710 Indianapolis Road
Ft. Wayne, IN 46899

SOLVENT/CONTAMINANT: Toluene/plastic
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 1983
REMARKS: "Happy to give reference."

Case No: F-3
PRODUCT: Machine parts
COMPANY: Campbell Chain
CONTACT: MR. Ralph Koch
3990 East Market Street
York, PA 17402

SOLVENT/CONTAMINANT: Varsol/oil
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 1/23/85
REMARKS: None

Case No: F-4
PRODUCT: Paint manufacturing
COMAPNY: Quality Coatings
CONTACT: Mr. Robert Wollard
P.O. Box 795
Tupelo, MS 38801
(601) 844-2777

SOLVENT/CONTAMINANT: Blend/paint
UNIT SIZE/GALLONS: 55
DATE INSTALLED: 1983
REMARKS: None

Case No: F-5
PRODUCT: Golf club grips
COMPANY: Eaton Corporation
CONTACT: Mr. Larry Scruggs
P.O. Box 1848
Laurinburg, NC 28352
(919) 276-6901

SOLVENT/CONTAMINANT: Toluene/rubber
UNIT SIZE/GALLONS: 55
DATE INSTALLED: 1983
REMARKS: None

Case No: F-6
PRODUCT: Pens
COMPANY: Faber-Castell
CONTACT: Mr. Charles Hill
551 Spring Place Road
Lewisburg, TN 37091
(615) 359-1583

SOLVENT/CONTAMINANT: MEK/ink
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 1983
REMARKS: Purchased 2nd unit for Midland, PA plant

Case No: F-7
PRODUCT: Adhesives
COMPANY: J. L. Clark
CONTACT: Mr. John Easto
51st and College Avenue
College Park, MD 20740
(301) 474-3100

SOLVENT/CONTAMINANT: Xylene/glue
UNIT SIZE/GALLONS: 15, 250
DATE INSTALLED: 1983
REMARKS: None

Case No: F-8
PRODUCT: Plastic parts
COMPANY: Alma Plastics
CONTACT: Mr. Clyde Parrott
600 South Kyle Street
Edinburgh, IN 46124
(812)526-5551

SOLVENT/CONTAMINANT: Toluene/paint
UNIT SIZE/GALLONS: 55
DATE INSTALLED: 6/15/83
REMARKS: None

Case No: F-9
PRODUCT: Resins and Coatings
COMPANY: Freda Chemical
CONTACT: Mr. Dave Harmon
P.O. Box 348A
Angola, IN
(219) 833-1496

SOLVENT/CONTAMINANT: Aromatic 100/pigments
UNIT SIZE/GALLONS: 55
DATE INSTALLED: 1/15/85
REMARKS: None

Case No: F-10
PRODUCT: Truck bodies
COMPANY: Kenworth
CONTACT: 8801 E. Marginal Way South
Seattle, WA 98108

SOLVENT/CONTAMINANT: Acetone/fiberglass
UNIT SIZE/GALLONS: 55
DATE INSTALLED: 7/30/85
REMARKS: "Very happy with unit's performance."

Case No: F-11
PRODUCT: Boat hulls
COMPANY: Livingston Boat Co.
CONTACT: Mr. Jack Laurey
3102 B Street, NW
Auburn, WA 98002
(206) 852-73874

SOLVENT/CONTAMINANT: Acetone/fiberglass
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 6/30/84
REMARKS: "Contact Jack Laurey anytime."

Case No: F-12
PRODUCT: Recreational vehicles
COMPANY: Winnebago Industries
CONTACT: Mr. Darryl Delzer
P.O. Box 152
Forest City, IA 50436

SOLVENT/CONTAMINANT: Alcohol/dirt
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 1983
REMARKS: 6 units in operation at this plant.

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RECOVERY REUSE AND RECYCLE OF SOLVENTS(U) DEFENSE
ENVIRONMENTAL LEADERSHIP PROJECT WASHINGTON DC
R W BOUBEL DEC 85

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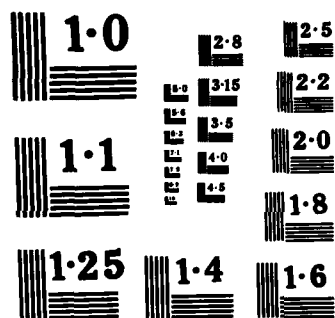
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NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

Case No: F-13
PRODUCT: Decorating
COMPANY: Fawn Plastics
CONTACT: Mr. Alvin Hill
401 Fawn Drive
Rocky Mount, NC 27801

SOLVENT/CONTAMINANT: Toluene/paint
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 1983
REMARKS: Fawn has 3 other units operating nationwide

Case No: F-14
PRODUCT: Aluminum siding
COMPANY: Seaway Industrial Paint
CONTACT: Mr. Daniel T. Wolf
2112 East 30th Street
Erie, PA 16510
(814) 898-0011

SOLVENT/CONTAMINANT: Toluene/paint
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 5/15/83
REMARKS: A letter of recommendation is on file

Case No: F-15
PRODUCT: Lighting fixtures
COMPANY: Morlite Equipment
CONTACT: Mr. Tom Raffensberger
321 Mechanic Street
Girard, PA
(814) 774-9631

SOLVENT/CONTAMINANT: Chlorinated solvent/grease
UNIT SIZE/GALLONS: 15
DATE INSTALLED: 7/15/85
REMARKS: "Very pleased with unit"

APPENDIX I

CIVILIAN R³ OF SOLVENTS, N.C. STUDY

Case Study No. C.1

TYPE: In-house recovery of laboratory solvents.

COMPANY: Celanese Fibers Operations

LOCATION: P.O. Box 32414
Charlotte, N. C. 28232

CONTACT: James Pullen, Manager of Environmental
Activities

PHONE: (704) 554-2000

PURPOSE: To reduce the amount of spent solvents to be
handled under RCRA.

MOTIVATION: - Cost of solvent disposal
- Cost of virgin solvent

**SOLD TO
MANAGEMENT:** - Economic payback (FREON recovery \$1650 per year)
- Reduction of liability under RCRA

**PAYBACK
PERIOD:** Since no new equipment was needed, payback
could be realized immediately.

Case Study No. C. 2

TYPE: Off-site solvent recovery

COMPANY: Celanese Fibers Operations

LOCATION: P.O. Box 32414
Charlotte, N. C. 28232

CONTACT: James Pullen, Manager of Environmental
Activities

PHONE: (704) 554-2000

PURPOSE: To recycle Dowtherm^R heat transfer medium
which has deteriorated due to thermal
decomposition

MOTIVATION: High cost of purchasing virgin Dowtherm^R

SOLD TO
MANAGEMENT: Economic Payback.

PAYBACK
PERIOD: No new equipment was needed.

COMMENTS: Net annual savings around \$160,000.00

Case Study No. C. 3

TYPE: Burning spent solvent for heat recovery

COMPANY: Celanese Fibers Operations

LOCATION: P.O. Box 32414, Charlotte, NC 28232

CONTACT: James Pullen, Manager of Environmental
Activities

PHONE: (704) 554-2000

PURPOSE: Recover heat from spent acetone which has
deteriorated due to thermal decomposition.

MOTIVATION: Liability under RCRA

SOLD TO
MANAGEMENT: Liability under RCRA

PAYBACK
PERIOD: No new equipment was needed. (Because of
heating value, cost is \$2,200 for 10,000
gallons annually).

Case Study No. C. 4

TYPE: Closed loop continuous distillation units for vapor degreasing

COMPANY: Westinghouse Electric Corporation Meter Plant

LOCATION: P.O. Box 9533
Raleigh, N.C. 27611

CONTACT: Norm Linnekin, Senior Engineer

PHONE: (919) 834-5271

PURPOSE: To continuously recycle spent solvent from the plant's vapor degreasers

MOTIVATION: Recycling by continuous distillation is for:

1. solvent economics,
2. consistent product cleanliness
3. reduction of air pollution for operator safety and preservation of the environment.

SOLD TO MANAGEMENT: Same as motivation

EQUIPMENT SUPPLIER:

- Detrex Corporation, Detroit, MI
- Westinghouse Electric Corp., Sykesville, MD
- Baron-Blakeslee, Chicago, IL
- Corpane Industries, Louisville, KY

PAYBACK PERIOD: Probably less than 5 years.

COMMENTS: The stills have been in place for several years.

Case Study No. C. 5

TYPE: Segregation and reuse of cleanup solvents
for paint manufacture

COMPANY: Desoto

LOCATION: 1025 Howard Street
Greensboro, NC 27403

CONTACT: Mr. Rick Thurston, Plant Engineer

PHONE: (919) 299-9351

PURPOSE:

- Reduce amount of virgin solvent purchased
- Reduce amount of spent solvent sent offsite
for reclamation or disposal

MOTIVATION:

- Increasing costs of virgin solvents
- Increasing costs for disposal and reclama-
tion of spent solvents

**SOLD TO
MANAGEMENT:**

- Cost savings without product quality degra-
dation. Reduced waste disposal problems.

**EQUIPMENT
SUPPLIER:** N/A

**PAYBACK
PERIOD:** Recycling 24,600 gallons of mineral spirits
per year.

Case Study No. C.6

TYPE: DYNA - 1-250 gallon still with steam injection

COMPANY: Southern Coatings

LOCATION: P.O. Box 160
Sumter, SC 29151

CONTACT: Mr. Roy McLaurin, Plant Engineer

PHONE: (803) 775-6351

PURPOSE: Recycle solvent from equipment cleanup.
Recycled solvent is:

- reused for cleanup
- used as fuel in two of the plant's boilers
- used in production of paint where solvent proportions are not critical (ex., tree marking paint, etc.)

MOTIVATION: High cost of virgin solvents

SOLD TO
MANAGEMENT: Economic payback

EQUIPMENT
SUPPLIER: DCI Corporation
Indianapolis, IN
(317) 872-6743
contact: Robert Zopf

PAYBACK
PERIOD: 9 months

COMMENTS: The boilers require a Fuel Burning Permit (State of South Carolina) and Southern coatings has applied for a TSD permit and has interim status.

Case Study No. C. 7

TYPE: LS-55 in-house still

COMPANY: Thiele-Engdahl

LOCATION: 1130 Fairchild Drive
Winston-Salem, NC 27105

CONTACT: Mr. Templeton Elliott, Executive Vice Pres.

PHONE: (919) 744-0145

PURPOSE: - Reduce solvents costs by recycling spent
solvents from equipment cleanup

- Minimize Thiele-Engdahl's exposure to
possible future liabilities under Superfund.

MOTIVATION: - Hazardous waste liability under Superfund

- High costs from virgin solvent purchases

SOLD TO
MANAGEMENT: Economic payback

PAYBACK
PERIOD: 2 years

EQUIPMENT
SUPPLIER: JAN Engineering
Stone Mountain, GA

Case Study No. C. 8

TYPE: LS - 15 in-house still.

COMPANY: Lenoir Mirror Company

LOCATION: P.O. Box 1650
Lenoir, NC 28645

CONTACT: Robert E. Miller, Plant Engineer

PHONE: (704) 728-3271

PURPOSE: Recycle spent xylene from equipment clean-up.

MOTIVATION:

- High costs of virgin solvent purchases.
- Risk of liability under RCRA.

**SOLD TO
MANAGEMENT:**

- Economic payback.

**PAYBACK
PERIOD:** 13 months

COMMENTS: Lenoir Mirror was able to reduce the amount of virgin xylene stored on-site, thus reducing fire hazard and increasing storage space.

Case Study No. C. 9

TYPE: In-house still - "Little Still" - LS-15

COMPANY: Bowling Company

LOCATION: P.O. Box 112
Mt. Olive, NC 28365

CONTACT: Mr. Blaney Jennette, Plant Manager

PHONE: (919) 658-4947

PURPOSE: To recover spent lacquer thinner from washoff operations

MOTIVATION: Possible future tightening of EPA restrictions governing incinerators.

**SOLD TO
MANAGEMENT:** - Economic payback
- Possible EPA restrictions

**EQUIPMENT
SUPPLIER:** JAN Engineering Company
736 Indian Manor Court
Stone Mountain, Georgia 30083
(404) 292-1711

**PAYBACK
PERIOD:** 1 year

Case Study No. C. 10

TYPE: In-house incinerator and boiler

COMPANY: Burlington Furniture Division

LOCATION: P.O. Box 907
Lexington, NC 27292

CONTACT: Mr. Wayne Kennedy, Environmental Engineer

PHONE: (704) 246-5961

PURPOSE: Burn spent solvents for heat recovery

MOTIVATION: Avoid costs and liability risks of landfill storage

SOLD TO MANAGEMENT:

1. Eliminated the perpetual liability of landfilling.
2. Less costly than paying someone else to dispose of it (hazardous waste).
3. Eliminated dependance on outside disposal services.
4. Maintains all hazardous waste operations "in-house".
5. Potential for profit for processing other firms' waste.

EQUIPMENT SUPPLIER: Incinerator - Consumat
Boiler - York Shipley

PAYBACK PERIOD: - around 3 years

COMMENTS: Burlington will burn spent finishing solvents from small furniture plants at a charge of \$29.00/55-gallon drum.

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